

U S ARMY
MATERIEL DEVELOPMENT AND READINESS COMMAND

PROGRAM ACCOMPLISHMENTS

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METHODS
&
TECHNOLOGY



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US ARMY INDUSTRIAL BASE ENGINEERING ACTIVITY
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29 SEP 1981

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SUBJECT: MM&T Program Accomplishments

SEE DISTRIBUTION

1. Reference AR 700-90, C1, Para 3-8e(2), Logistics, Army Industrial Preparedness Program, dated 10 March 1977.
2. This brochure illustrates some of DARCOM's MM&T Program Accomplishments. It presents the achievements by Major Subordinate Commands with emphasis on illustration of the types of projects pursued. Projects that have anticipated benefits and implemented efforts with actual benefits have been placed in separate sections to provide a clear distinction between them. A summary has been provided as the first section of the document to provide an overview.
3. Further information on the projects illustrated in this brochure should be obtained from the MM&T representatives, project officers shown, or from Mr. James Carstens, Chief, Manufacturing Technology Division, AV 793-5113.

A handwritten signature in dark ink, appearing to read "James R. Gallaugh", is written over the typed name "J. R. GALLAUGH".

J. R. GALLAUGH

Director
Industrial Base Engineering Activity

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INTRODUCTION

The Army Manufacturing Methods and Technology (MMT) Program was begun in 1964. The purpose of the program is to develop new manufacturing processes that can be applied to the production of Army items. Over the years hundreds of these projects have been funded and used to develop new technology. This brochure records the results of some of those projects.

Much literature has been written concerning the transfer of technology from the "laboratory" to actual production. It is often difficult to make this transition; however, the full benefits of new technology can be obtained only if this transition has been made. The Army is placing more emphasis on technology transfer to attain greater project benefits. This brochure is widely distributed throughout the Army in order to publicize the results and disseminate knowledge to potential users. Other methods of accomplishing this transfer are through end of project demonstrations; preparation of technical reports, project summary reports, and technical notes; and, through inclusion of technology information in bulletins and journals. All of these techniques, however, serve only to disseminate the information. Real benefits can only accrue once the new technology is implemented.

MMT POINTS OF CONTACT

<u>COMMAND CODE</u>	<u>REPRESENTATIVE</u>	<u>PHONE</u>
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2 of H	Mr. Joseph Key US Army Electronics R&D Command ATTN: DELET-R Fort Monmouth, NJ 07703	AV 995-4258 (201) 544-4258
3 or R	Mr. Richard Kotler US Army Missile Command ATTN: DRSMI-RST Redstone Arsenal, AL 35898	AV 746-1835 (205) 876-1835
4 or T	Dr. James Chevalier US Army Tank-Automotive Command ATTN: DRSTA-RCKM Warren, MI 48090	AV 273-2065 (313) 573-2065

MMT POINTS OF CONTACT

<u>COMMAND</u>	<u>REPRESENTATIVE</u>	<u>PHONE</u>
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	Mr. Joseph Tagliarino US Army Munitions Production Base Modernization Agency ATTN: SARPM-PBM-DP Dover, NJ 07801	AV 880-6708 (201) 328-6708
6	Mr. August Zahatko US Armament Material Readiness Command ATTN: DRSAR-IRB Rock Island Arsenal Rock Island, IL 61299	AV 793-4485/3730 (309) 794-4485/3730
7 or E	Mr. R. Goehner US Army Mobility Equipment R&D Command ATTN: DRDME-UE Fort Belvoir, VA 22060	AV 354-5530 (703) 664-5530
0	Mr. Grover Shelton US Army Test & Evaluation Command ATTN: DRSTE-AD-M Aberdeen Proving Ground, MD 21005	AV 283-3677 (301) 278-3677

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SECTION I

SUMMARY OF BENEFITS

ACCOMPLISHMENTS SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS		ACTUAL BENEFITS		REMARKS
	\$ SAVINGS	OTHER	\$ SAVINGS	OTHER	
7 73,74&75 3509		SIX CONFIGURATIONS CAN BE PRODUCED			SELECTION OF A COMMERCIAL PRO- DUCER IS IN PROCESS
E 78 3587	\$576,000/YR				IMPLEMENTATION WILL BE AT LONGHORN AAP
2 76 9758	\$4.4 MILLION	FEWER PROCESSING STEPS			
2 71 9306					TECHNOLOGY BEING USED BY D.O.E.
2 71 9365					NO CURRENT REQUIREMENTS
2 73 9378		4000 UNIT/MONTH CAPABILITY			USED IN AN/TPN-18, AN/TPQ-28 & AN/PPS 4, 5, & 6
2 74 9426	\$160/UNIT				USED IN AN/GVS-5 LASER RANGE FINDER
2 72 9498	\$6.8 MILLION/YR	PROCESS YIELD IMPROVEMENTS			USED IN AN/AMQ-23 ATMOSPHERIC PROBE
2 73 9614		90 AMP-200VDC TRAN- SISTOR			USED IN PP-4126 BATTERY CHARGER & PP-6183 ISOLATOR
2 73 9615		LESS EXPENSIVE & LIGHER UNIT			MAINTENANCE PROBLEMS PREVENT IMPLEMENTATION
2 73 9637		IMPROVED PERFORMANCE			NO REQUIREMENTS
2 75 9673	NOT QUANTIFIED				DESIGN GUIDELINES MANUAL
2 76 9783	\$20/GRAM				FOLLOW-ON PROJECT WILL COMPLETE THE EFFORT
1 78 7036	\$1.3 MILLION/YR	REDUCE PROCESSING STEPS			
1 74&75 8120		IMPROVED PROPERTIES			TECHNICAL REPORT IS AVAILABLE

ACCOMPLISHMENTS SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS		ACTUAL BENEFITS		REMARKS
	\$ SAVINGS	OTHER	\$ SAVINGS	OTHER	
3 74 & 75 3070	\$40,000/YR				NONDESTRUCTIVE TESTING OF CART-RIDGE CASES
3 75 3076	20% REDUCTION	SIMPLER DESIGN			FOLLOW-ON PROJECTS WILL COMPLETE THE EFFORT
R 78 3116	\$13.8 MILLION				SEEKER OPTICS AND DETECTOR (STINGER-POST)
3 75 & 77 3134		IMPROVED PERFORMANCE			THERMOIONIC EMITTERS AND OTHER APPLICATIONS
R 78 3136	\$960,000/YR				COPPERHEAD SEEKER HEAD
R 78 3204	\$13.1 MILLION				FOLLOW-ON PROJECTS WILL COMPLETE THE EFFORT
3 76 3230	\$6.1 MILLION				NAVY TOMAHAWK MISSILE
R 78 3268	\$450,000/YR				FOLLOW-ON PROJECT WILL COMPLETE THE EFFORT
4 74 4371		20 to 30% DURABILITY IMPROVEMENT			SPECIFICATION IS BEING CHANGED
T 78 4575	\$140,000/YR				FOLLOW-ON PROJECT WILL COMPLETE THE EFFORT
5 75 1250		IMPROVED TESTING			FOLLOW-ON PROJECTS WILL INSTALL AT PINE BLUFF ARSENAL
5 73,74,75,76, & 7T 1264	\$2.0 MILLION AVOIDANCE				REQUIREMENT CHANGE PREVENTED FULL IMPLEMENTATION
5 75 1316	\$750,00/YR	SAFETY & POLLUTION ABATEMENT			PLANNED FOR PINE BLUFF ARSENAL
5 73 & 74 3048		100% FUSE SENSITIVITY TESTING			USED FOR R&D SUPPORT
5 76,7T&77 3127	\$1.50/UNIT	CAPABILITY OF 1 MILLION UNITS/YR			M734 FUSE APPLICATION
5 77&78 3947	\$14 MILLION/YR	650 DEVICES/HR RATE			LACK OF FUNDS PREVENTED PROJECT COMPLETION
5 73&75 4012	\$145,000/YR	INCREASED SAFETY			

ACCOMPLISHMENTS SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS		ACTUAL BENEFITS		REMARKS
	\$ SAVINGS	OTHER	\$ SAVINGS	OTHER	
5 72,73&75 4015		CONTINUOUS PROCESS- ING			REQUIREMENT REDUCTION PREVENTED IMPLEMENTATION
5 73&74 4105	\$3.1 MILLION/YR				FOLLOW-ON PROJECTS WILL COMPLETE THE EFFORT
5 70 4109		PILOT PRODUCTION CAPABILITY			TECHNICAL DATA IS AVAILABLE
5 78 4163		REDUCED REJECT RATE			FOLLOW-ON PROJECTS WILL COMPLETE THE EFFORT
5 71&72 4173		REMOTE PROCESSING			A MORE ECONOMICAL ALTERNATIVE PREVENTED IMPLEMENTATION
5 73&74 4216		FEWER OPERATORS & ENTANGLEMENTS			
5 71&72 4218	\$1.7 MILLION/YR				2.75 INCH ROCKET
5 75 4245		INCREASED SAFETY & REDUCED LOSSES			BADGER, LONESTAR & LOUISIANA AAP'S
5 7T 4285		INCREASED SAFETY			INCORPORATED INTO SPECIFICATIONS
5 77 4285		BLAST RESISTANT FACILITIES			TECHNICAL REPORTS ARE AVAILABLE
5 77 4289		INCREASED SAFETY			FOR INSTALLATION AT RADFORD CASBL & CAMBL LINES
5 78 4289		HAZARD CLASSIFICA- TIONS			
5 77 4291		INCREASED BLAST RESISTANCE			REVISIONS TO SAFETY DOCUMENTS
5 76 4443		PROCESS IMPROVEMENTS			BAG LOADING OPERATIONS

ACCOMPLISHMENTS SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS		ACTUAL BENEFITS		REMARKS
	\$ SAVINGS	OTHER	\$ SAVINGS	OTHER	
5 77 6716		COMPUTER DIAGNOSTIC TOOL			
6 70&71 6771		REDUCED MACHINING TIME			175MM & 8 INCH BREECH BLOCKS
6 71&72 6915		ALTERNATIVE MACHINING METHODS			NO IMPLEMENTATION PLANNED
6 71 7028	\$413,000/YR	REDUCED TIME			105MM, 155MM & 8 INCH PARTS
6 71 7030					M68 & M113 CANNONS AND TEST SPECIMENS
6 71 7061		INCREASED TEST CAPABILITY			LASER MATERIALS
6 76 7241		REDUCED HONING TIME			CANNON BARREL BORES

IMPLEMENTATION SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS		ACTUAL BENEFITS		REMARKS
	\$ SAVINGS	OTHER	\$ SAVINGS	OTHER	
M 76 6350-1831	\$180,000/YR	REDUCED SCRAP			105MM-M68 CANNON TUBE
M 77 6350-1849	\$20,000/YR				105MM-M68 CANNON TUBE
2 71 9500			\$1.9 MILLION		PROXIMITY FUSES
H 73 9526	\$2.9 MILLION			\$130,000 TESTED CHIPS/MO.	PIN DIODES
2 7X 9641			\$100,000/YR		MICROWAVE DEVICES & MULTILAYER CIRCUIT BOARDS
1 XX 7046			\$922/UNIT	MATERIAL SAVINGS	T700 COMPRESSOR
3 75 3119	\$1.7 MILLION	REDUCED TEST TIME			LASER DESIGNATORS
5 74 1261	\$49,000			SAFETY/HEALTH IMPROVEMENTS	WHITE PHOSPHOROUS STORAGE TANKS
5 7X 1274			\$5.2 MILLION	REDUCED AIR/ WATER POLLUTION	WHITE PHOSPHOROUS MUNITIONS
5 76 3139	\$100,000				M60A1 GUN STABILIZATION SYSTEM
5 7X 4069		MANPOWER CONSERVA- TION			60 AND 81 MM ROUNDS
5 78 4148			\$733,000		8 INCH MOTOR BODY (M650 RAP)
5 77 4416			\$2.4 MILLION		GEMSS SAFE & ARM
5 7X 6769			\$314,000		152MM-M68 AND 60MM-M225
6 70 7106			\$257,100		152MM-M18E1 COUPLING
6 7X 7180	\$1.65 MILLION				INFRARED OPTICAL ELEMENTS
6 73 7242	\$981,000				CANNON BARREL
6 74&76 7402	\$6500/YR	INCREASED CAPABILITY SIMPLIFIED TESTING PROCESS IMPROVEMENTS			105MM-M68 CANNON BARRELS
6 75 7555	\$565,000/YR				CANNON BREECH MECHANISMS
6 77 7588	\$600/CANNON BARREL				105MM-M68 CANNON BARRELS
6 77 7733			\$24,000/YR	REDUCED MACHIN- ING	8 INCH M201 CANNON BARREL

SECTION II

RECENTLY COMPLETED OR ACTIVE PROJECTS

DARCOM MMT ACCOMPLISHMENT

SELF-LUMINOUS LIGHTS

PROJECT NO: 7 73 3509, 7 74 3509 & 7 75 3509

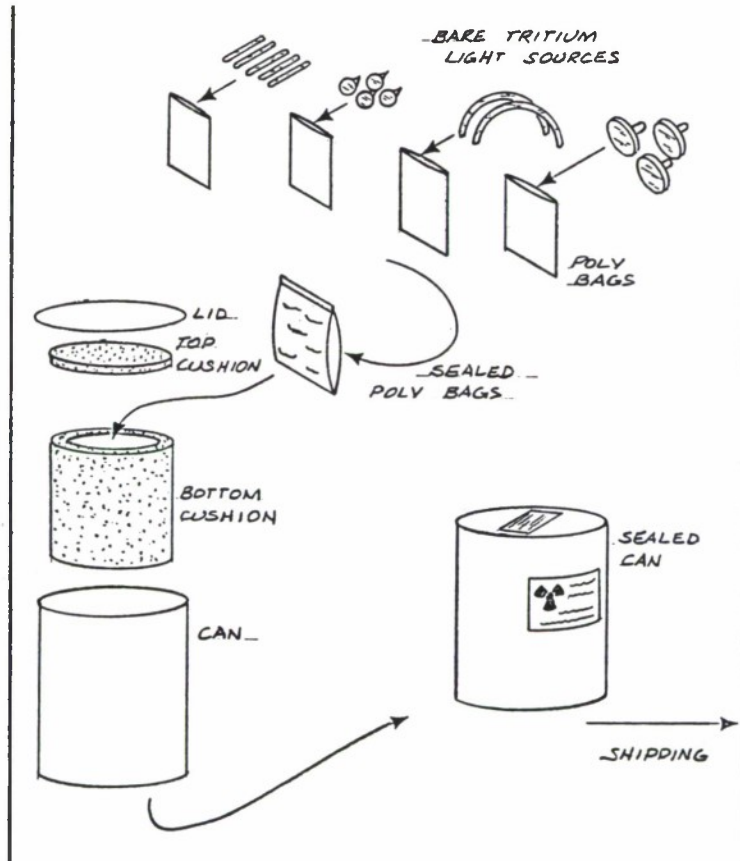
TITLE: PRODUCTION TECHNOLOGY FOR SELF-LUMINOUS LIGHT SOURCES

COST: \$495,000 TOTAL

RESULTS

- AUTOMATED EQUIPMENT FOR THE PRODUCTION OF SIX BASIC GEOMETRICAL SHAPES OF SELF LUMINOUS LIGHTS.
- PROCESSES AND PROCEDURES WERE SUCCESSFULLY VERIFIED BY A PILOT LINE RUN OF 11,900 INDIVIDUAL SOURCES.
- THE PILOT LINE AND PROCEDURES WERE VERIFIED BY A LIMITED PRODUCTION RUN OF 11,900 INDIVIDUAL SOURCES.
- THE EQUIPMENT IS IN STORAGE AT LETTERKENNY DEPOT AWAITING SELECTION OF A COMMERCIAL MANUFACTURER.

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PACKAGING OF BARE TRITIUM SOURCES

DARCOM MMT ACCOMPLISHMENT

ROCKET PROPELLANT

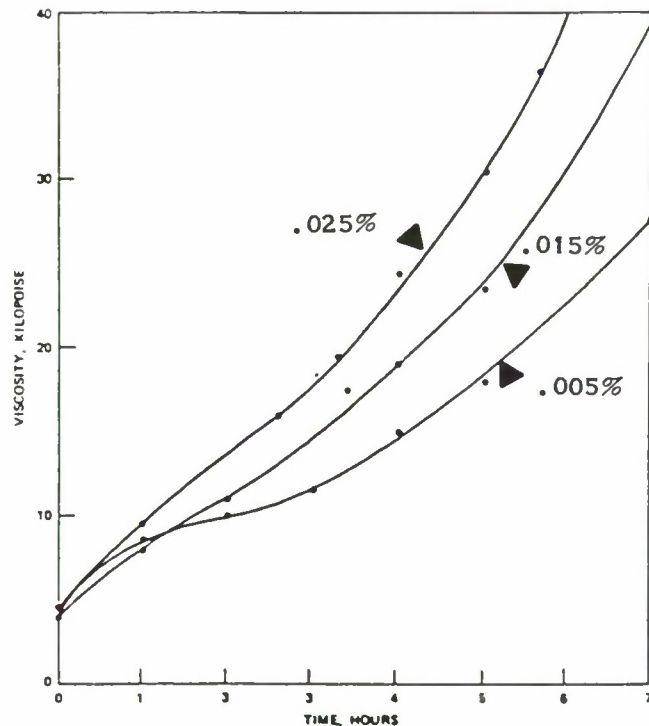
PROJECT NO: E 78 3587

TITLE: SLUFAE ROCKET MOTOR

COST: \$210,000

RESULTS

- THE PRIMARY PURPOSE OF THIS PROJECT WAS TO INCREASE THE USEFUL "POT LIFE" OF THE PROPELLANT TO IMPROVE CASTING EFFICIENCY.
- THE POT LIFE WAS EXTENDED FROM 3 HOURS TO OVER 6 HOURS BY REPLACING 2% OF THE BINDER WITH DIOCTYL ADIPATE PLASTICIZER. A SMALL AMOUNT OF TRIPHENYL BISMUTH WAS ALSO ADDED TO PREVENT INCREASING THE GEL TIME.
- THESE IMPROVEMENTS WILL BE IMPLEMENTED AT LONGHORN AAP AND A SAVINGS OF \$30 PER MOTOR ARE ESTIMATED AT A PRODUCTION RATE OF 1600 MOTORS PER MONTH.



EFFECT OF TRIPHENYL BISMUTH
PERCENTAGE ON VISCOSITY

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DARCOM MMT ACCOMPLISHMENT

METAL NITRIDE OXIDE SEMICONDUCTORS

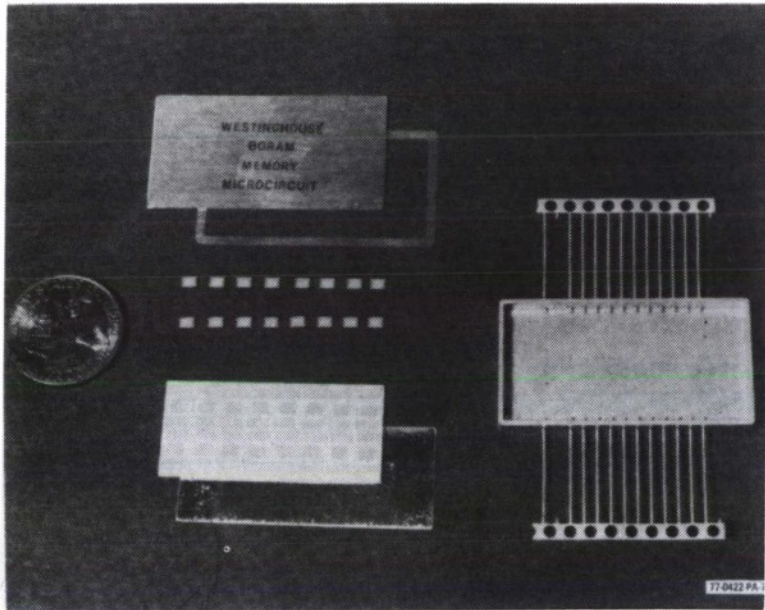
PROJECT NO: 2 76 9758

**TITLE: PRODUCTION PROCESSES FOR METAL
NITRIDE OXIDE SEMICONDUCTORS FOR
BORAM.**

COST: \$724,000

RESULTS

- **THIS PROJECT PROVIDED THE ABILITY TO PRODUCE AN ALL ELECTRONIC MEMORY SYSTEM AT AN AFFORDABLE PRICE.**
- **A PILOT LINE CAPABILITY WAS ESTABLISHED THAT INCORPORATED FEWER PROCESSING STEPS AND HIGHER YIELDS.**
- **THE HYBRID IS INCORPORATED IN THE ACCIDENT INFORMATION RETRIEVAL SYSTEM FOR AVRADCOM AND THE F16 RADAR. SEVERAL OTHER APPLICATIONS ARE BEING EVALUATED.**
- **ESTIMATED SAVINGS AS A RESULT OF IMPLEMENTING THIS PROJECT ARE \$4.4 MILLION.**



BORAM COMPONENT PARTS

DARCOM MMT ACCOMPLISHMENT

NICKEL/ZINC BATTERIES

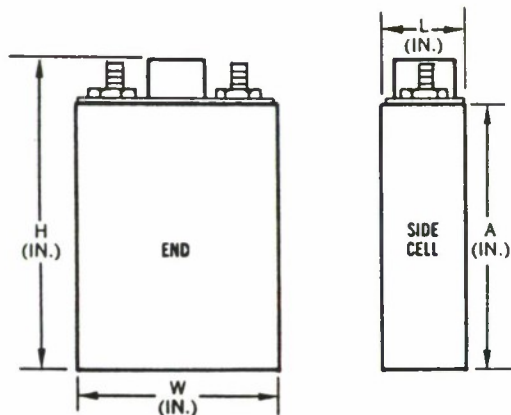
PROJECT NO: 2 71 9306

TITLE MMT MEASURE FOR NICKEL/ZINC
BATTERIES

COST: \$200,000

RESULTS

- DEVELOPED A MASS PRODUCTION TECHNIQUE FOR THE FABRICATION OF NICKEL/ZINC BATTERIES.
- THE NEW PROCESS INVOLVED COMBINING POWERED ZINC WITH POWDERED TEFLON AND THEN SINTERING RESULTED IN A MORE PRODUCIBLE PLATE.
- THE BATTERIES DEVELOPED FROM THIS PROGRAM WERE TECHNICALLY SUCCESSFUL HOWEVER THEIR COST AND PERFORMANCE IMPROVEMENTS WERE NOT SUFFICIENT FOR ARMY NEEDS.
- THE KNOWLEDGE GAINED IN THIS PROGRAM IS BEING APPLIED BY DOE IN THE DEVELOPMENT OF NI/ZN BATTERIES FOR ELECTRIC VEHICLE PROPULSION.



Representative
Dimensions (In.)

L	1.0 - 1.3
W	2.2 - 2.3
H	3.0 - 7.5
A	2.5 - 7.0

TYPICAL NICKEL/ZINC BATTERY CELLS

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DARCOM MMT ACCOMPLISHMENT

MICROSTRIP CIRCUIT PACKAGES

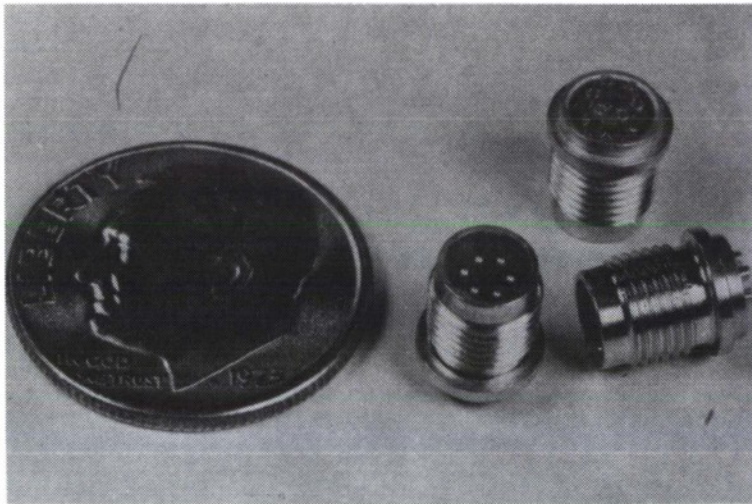
PROJECT NO: 2 72 9365

TITLE: PACKAGES FOR MICROSTRIP INTEGRATED CIRCUITS

COST: \$174,000

RESULTS

- **PACKAGE STANDARDS FOR SUBSTRATE SIZES OF 1X1, 1X2, 2X2 & 2X4 INCHES WERE DEVELOPED. THE STANDARDS COVERED PACKAGING, WELDING, HERMETIC SEALING AND REPAIRABILITY.**
- **THE BASIC PRODUCTION PROCESSES DEMONSTRATED THAT HIGH QUALITY PACKAGES CAN BE DESIGNED AND FABRICATED AT LOW COST.**
- **THE STANDARDS WILL BE IMPLEMENTED AS STANDARD MICROWAVE INTEGRATED CIRCUITS ARE DEVELOPED.**



HERMETRIC DC CONNECTOR

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DARCOM MMT ACCOMPLISHMENT

HIGH RELIABILITY MIXER DIODES

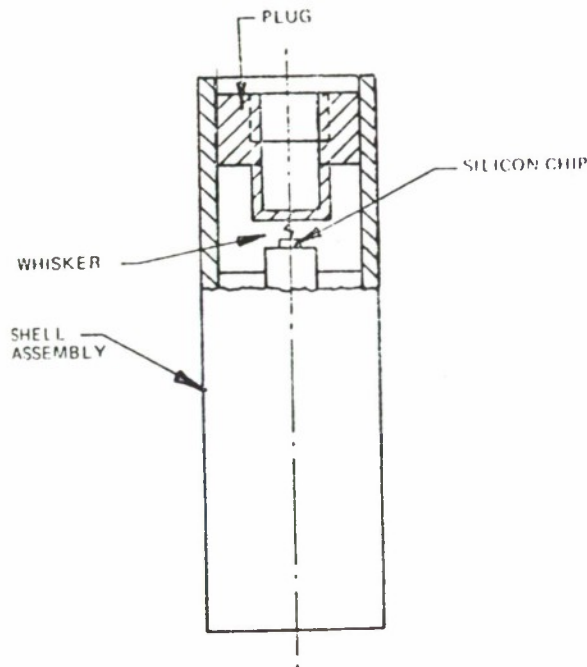
PROJECT NO: 2 73 9378

TITLE: HIGH BURN-OUT RESISTANT MIXER DIODE

COST: \$215,000

RESULTS

- **A MANUFACTURING CAPABILITY FOR ECONOMICALLY PRODUCING LOW NOISE AND HIGH BURN OUT RESISTANT DIODES WAS ESTABLISHED.**
- **A PILOT RUN OF 435 DIODES WAS MADE TO DEMONSTRATE THE LINE CAPACITY OF 4000 UNITS PER MONTH. THE ELECTRICAL PARAMETERS WERE THEN VERIFIED OVER THE DEVICE FREQUENCY BAND.**
- **THE DIODES ARE CURRENTLY BEING UTILIZED ON A REPLACEMENT BASIS FOR THE AN/TPN-18, AN/TPQ-28 AND AN/PPS-4, 5 & 6. PRIOR TO THIS EFFORT THE DIODES WERE NOT COMMERCIALY AVAILABLE.**



**SCHOTTKY COAXIAL
DIODE ASSEMBLY**

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DARCOM MMT ACCOMPLISHMENT

INFRARED DETECTORS

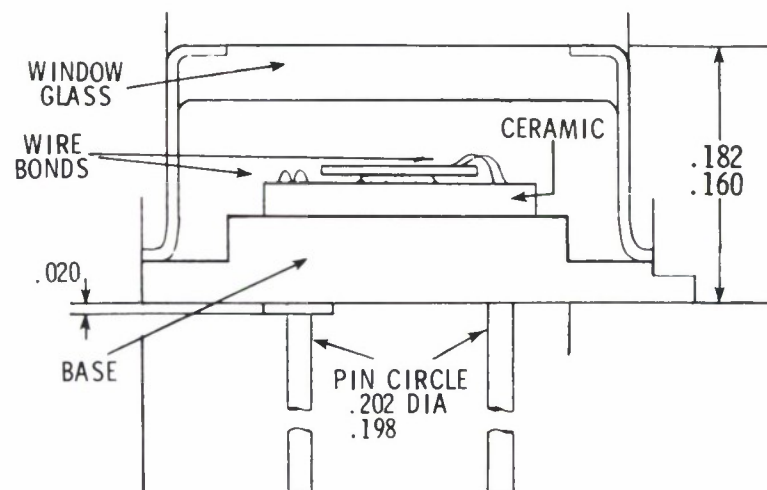
PROJECT NO: 2 74 9426

TITLE: MANUFACTURING METHODS FOR THE
FABRICATION OF LARGE AREA SILICON
AVALANCHE INFRARED DETECTORS

COST: \$247,000

RESULTS

- PRODUCTION PROCESSES FOR IMPROVING QUALITY AND INCREASING THE YIELD OF LARGE AREA SILICON AVALANCHE DETECTORS WERE DEVELOPED. A PILOT RUN OF 100 UNITS WAS MADE TO VERIFY THE PROCESSES.
- THE DETECTOR IS NOW AVAILABLE AS A PRODUCTION ITEM AND IS CURRENTLY BEING USED IN THE AN/GVS-5 LASER RANGE FINDER MODULE.
- AS A RESULT OF THIS PROJECT THE DETECTOR PRICE WAS REDUCED FROM \$335 TO \$175.



ASSEMBLY OF SCS 467

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DARCOM MMT ACCOMPLISHMENT

THIN FILM CIRCUITS

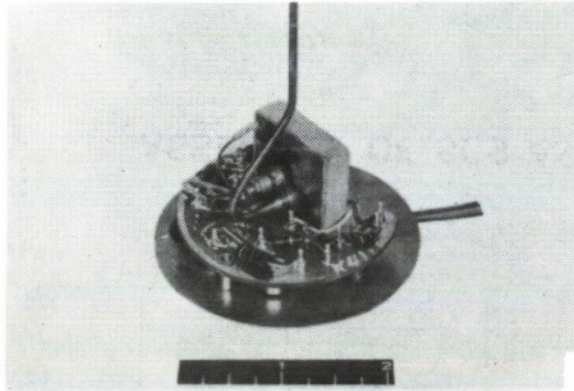
PROJECT NO: 2 72 9498

**TITLE: L BAND MICROWAVE INTEGRATED
CIRCUITS**

COST: \$434,000

RESULTS

- **THIS PROJECT RESULTED IN INCREASED PRODUCTION CAPABILITY FOR AN IMPROVED RADIOSONDES FOR HIGH ALTITUDE WEATHER BALLOONS.**
- **AN ESTIMATED PRODUCTION RATE OF 4000 UNITS PER MONTH WAS ACHIEVED.**
- **OVERALL PROCESS YIELDS WERE INCREASED FROM 50% TO 80-90% AND THE UNIT PRICE WAS REDUCED FROM \$75 TO AN ESTIMATED \$7.00. THIS WOULD RESULT IN AN ESTIMATED \$6.8 MILLION SAVINGS AT A 100,000/YEAR PRODUCTION RATE.**
- **THESE DEVICES WERE INCORPORATED DIRECTLY INTO THE AN/AMQ-23 ATMOSPHERIC METEOROLOGICAL PROBE.**



**TRANSMITTER MODULE BASE PLATE
SUBASSEMBLY**



RADIOSONDE TRANSMITTER MODULE

OCT 81

DARCOM MMT ACCOMPLISHMENT

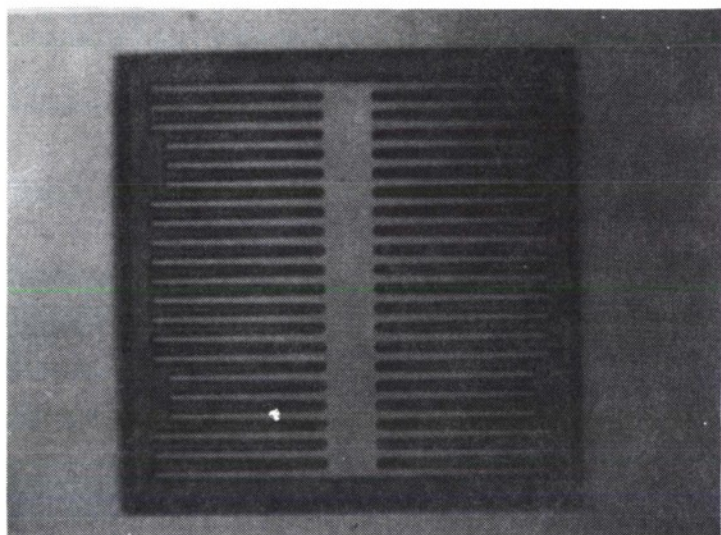
HI POWER TRANSISTOR

PROJECT NO: 2 73 9614

**TITLE: MEASURE FOR HIGH CURRENT, FAST
SWITCHING TRANSISTOR**

COST: \$102,610

RESULTS



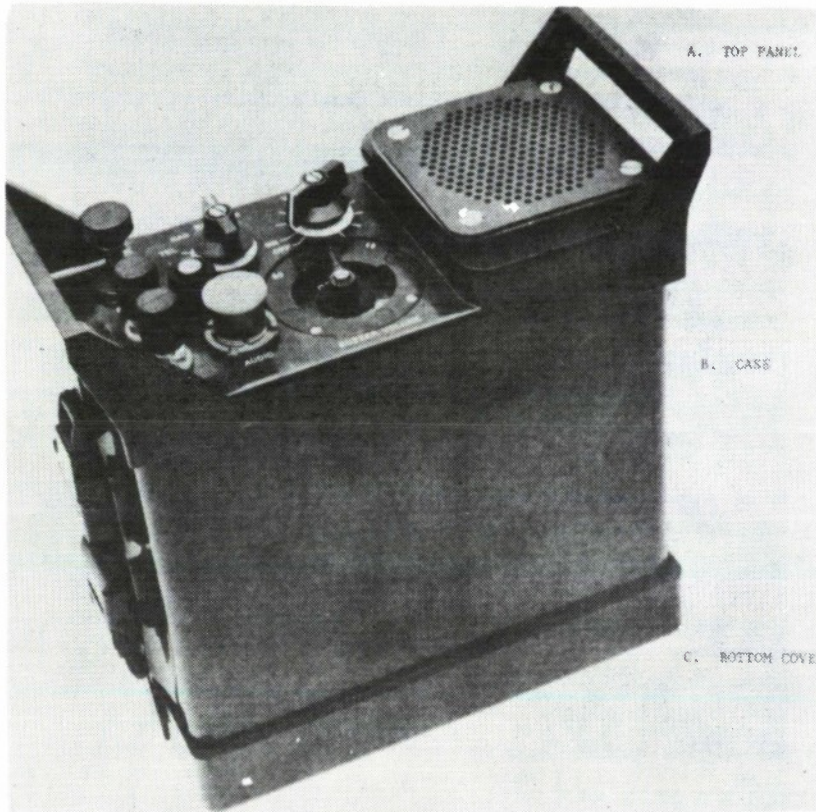
.550" TRANSISTOR CHIP

- **A METHOD WAS DEVELOPED TO PRODUCE A 90 AMP, 200 VDC FAST SWITCHING TRANSISTOR FOR HEAVY SWITCHING SUCH AS OCCURS IN POWER SUPPLIES AND POWER CONVERTERS.**
- **A DOUBLE EPITAXIAL PROCESS WAS USED TO OBTAIN THE HIGH VOLTAGE STRUCTURE. AN INCREASE OF APPROXIMATELY 100 VOLTS OVER A SINGLE DIFFUSED PROCESS WAS OBTAINED.**
- **THESE UNITS ARE NOW AVAILABLE COMMERCIAL-
LY AND ARE USED BY THE ARMY IN THE PP-4126
BATTERY CHARGER AND THE PP-6183 ISOLATOR.**

OCT 81

DARCOM MMT ACCOMPLISHMENT

PLASTIC HOUSINGS



**GRA/39 RADIO
WITH PLASTIC HOUSING**

PROJECT: 2 73 9615

TITLE: MMT FOR PLASTIC HOUSINGS

COST: \$130,000

RESULTS

- **AN INJECTION MOLDED LEXAN CASE WAS DEVELOPED AS A RADIO HOUSING.**
- **THE HANDLES ARE INCORPORATED AS AN INTEGRAL PART OF THE TOP COVER. THIS ELIMINATES SEVERAL SUBASSEMBLIES THAT WERE IN THE INITIAL DESIGN.**
- **THIS HOUSING IS APPROXIMATELY 6 POUNDS LIGHTER THAN THE METAL ASSEMBLY AND COSTS ONLY HALF AS MUCH.**
- **THIS PROJECT WAS NOT IMPLEMENTED BECAUSE BREAKAGE OF THE HANDLES WOULD REQUIRE REPLACEMENT OF THE WHOLE FRONT PANEL.**

OCT 81

DARCOM MMT ACCOMPLISHMENT

POLYSULFONE CAPACITORS

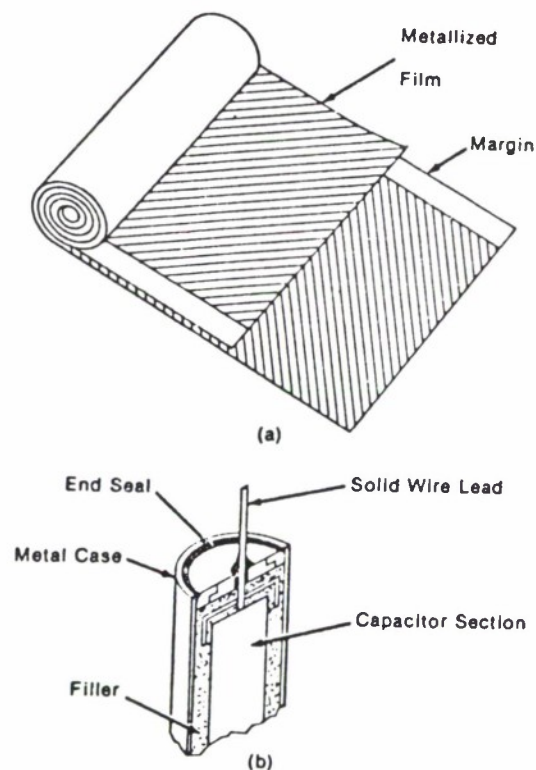
PROJECT NO: 2 74 9637

TITLE: MANUFACTURING METHODS FOR THE PRODUCTION OF POLYSULFONE CAPACITORS FOR SHORT INTRUSION PROXIMITY FUZE

COST: \$43,000

RESULTS

- POLYSULFONE CAPACITORS EXHIBIT A VERY SMALL CHANGE IN CAPACITANCE WITH TEMPERATURE AND ARE WELL SUITED FOR TIMING APPLICATIONS WHERE LARGE OPERATING TEMPERATURE CHANGES OCCUR.
- A PILOT PRODUCTION CAPABILITY OF 3000 CAPACITORS WAS ESTABLISHED.
- THE CAPACITORS SATISFACTORILY PASSED ALL QUALIFICATION TESTS INCLUDING A 25,000 G SHOCK TEST.



SUBMINIATURE CAPACITOR

OCT 81

DARCOM MMT ACCOMPLISHMENT

ELECTRONIC COMPONENT ASSEMBLY

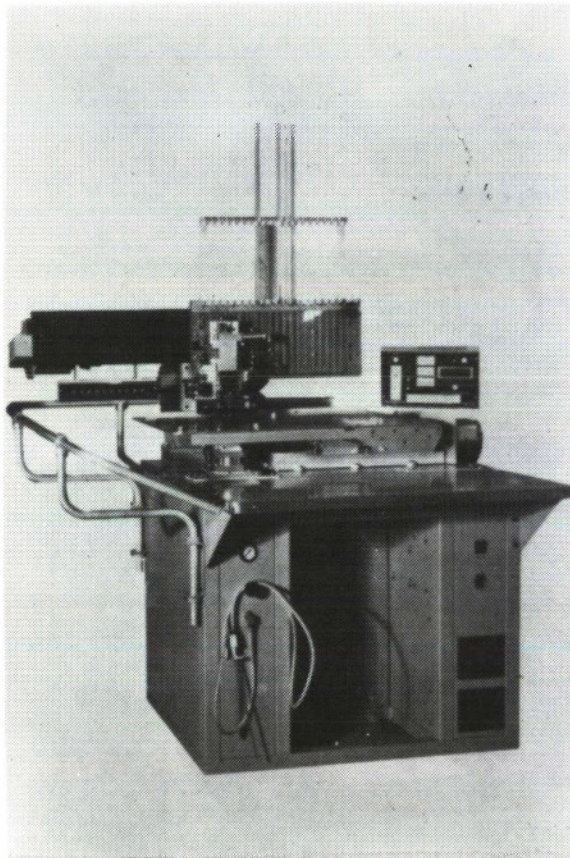
PROJECT NO: 2 75 9673

**TITLE: STUDY OF TECHNIQUES FOR COMPONENT
ASSEMBLY-ELECTRONICS PRINTED
CIRCUIT BOARDS**

COST: \$100,000

RESULTS

- **THIS PROJECT RESULTED IN A "GUIDELINES MANUAL" FOR DETERMINING THE LEAST COST ASSEMBLY METHODS BASED ON PRODUCTION REQUIREMENTS.**
- **THE ASSEMBLY METHODS CONSIDERED WERE MANUAL, SEMIMANUAL, SEMIAUTOMATIC, AUTOMATIC AND COMBINED MANUAL AND AUTOMATIC.**
- **THE BENEFITS ARE DIFFICULT TO QUANTIFY DUE TO THE BROAD APPLICATION, MANY COPIES HAVE BEEN REQUESTED BY ELECTRONICS CONTRACTORS**



AUTOMATIC DIP INSERTER

OCT 81

DARCOM MMT ACCOMPLISHMENT

HIGH PURITY SILICON

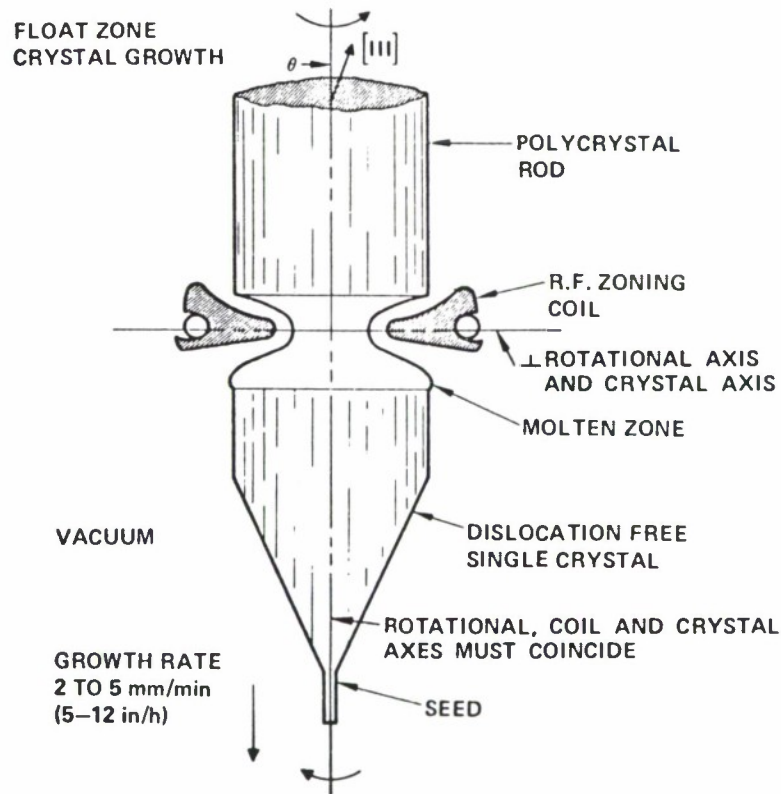
PROJECT NO: 2 76 9783

TITLE: PRODUCTION OF HIGH RESISTIVITY
SILICON MATERIAL

COST: \$591,800

RESULTS

- PROCEDURES AND EQUIPMENT FOR VACUUM ZONE REFINING OF POLYCRYSTALLINE RODS INTO HIGH PURITY SINGLE CRYSTAL RODS WERE DEVELOPED.
- A DOUBLE SIDED POLISHING PROCEDURE WAS DEVELOPED TO ELIMINATE WAFER TAPER, SURFACE DAMAGE AND EDGE CHIPPING.
- A FOLLOW-ON PROJECT TO AUTOMATE THE ZONE REFINING EQUIPMENT AND PROCEDURES IS EXPECTED TO REDUCE THE COST OF THE WAFERS FROM \$30 PER GRAM TO \$5-\$15 PER GRAM.



FLOAT ZONE CRYSTAL GROWTH

OCT 81

DARCOM MMT ACCOMPLISHMENT

ISOTHERMAL ROLL FORGING

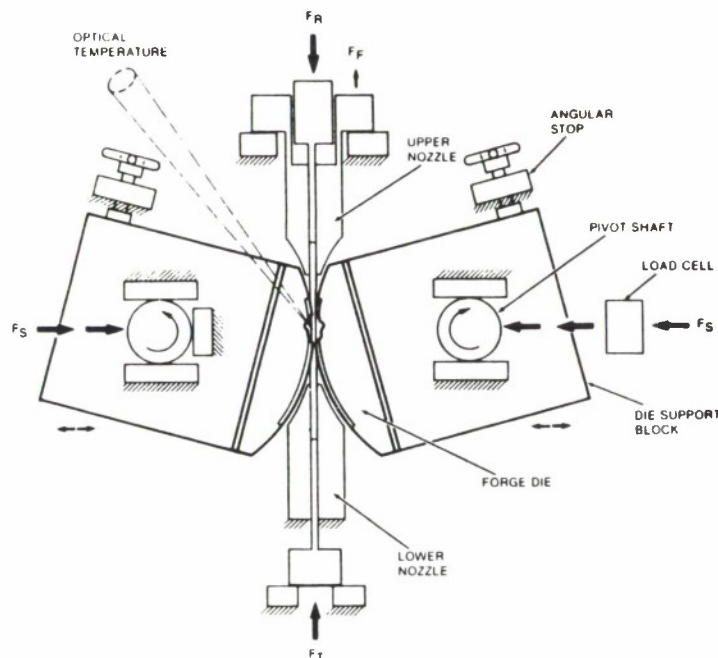
PROJECT NO: 1 78 7036

TITLE: ISOTHERMAL ROLL FORGING OF TSS
COMPRESSOR BLADES - PHASE II

COST: \$425,000

RESULTS

- THE PURPOSE OF THESE PROJECTS WAS TO REDUCE THE COST OF COMPRESSOR BLADES BY REPLACING THE COLD ROLL FORGING WITH HOT ROLL FORGING. THE HOT FORGING METHOD WILL REDUCE THE NUMBER OF FORGING REPETITIONS REQUIRED.
- THIS PROJECT PROVIDED THE TECHNIQUES AND EQUIPMENT AND THE NEXT PHASE WILL PROVIDE BLADE SETS FOR ENGINE RUNNING.
- COMPLETION AND IMPLEMENTATION OF THIS EFFORT WILL RESULT IN ESTIMATED SAVINGS OF \$1.3 MILLION.



BLADE FORGING MACHINE

OCT 81

DARCOM MMT ACCOMPLISHMENT

CONTROLLED SOLIDIFICATION

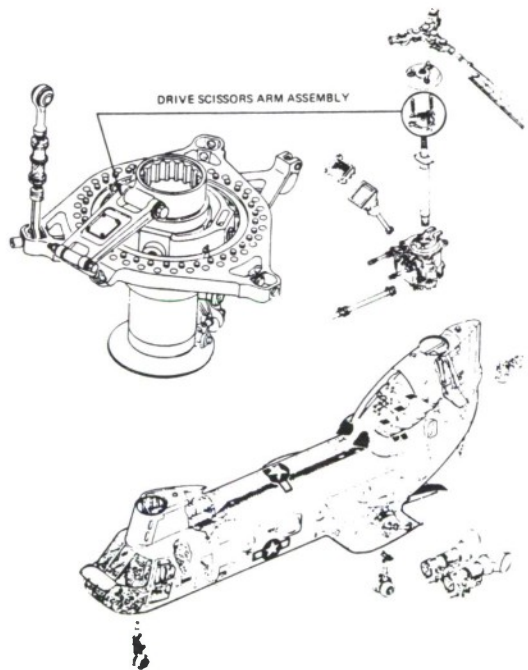
PROJECT NO: 1 74 8120 & 1 75 8120

**TITLE: IMPROVED HELICOPTER SKIN MATERIAL
BY CONTROLLED SOLIDIFICATION AND
THERMAL-MECHANICAL TREATMENTS**

COST: \$275,000 & \$250,000

RESULTS

- **A FORGED ALUMINUM ALLOY IN THE 7XXX FAMILY WITH EQUAL OR SUPERIOR STRENGTH AND TOUGHNESS WHEN COMPARED TO COMMERCIALLY AVAILABLE SIMILAR ALLOYS WAS DEVELOPED.**
- **THE IMPROVED PROPERTIES WERE OBTAINED BY REFORGING AT A LOWER THAN CONVENTIONAL TEMPERATURE FOLLOWED BY A HIGH TEMPERATURE THERMAL TREATMENT RESULTING IN A FINE-GRAINED EQUIAXED STRUCTURE.**
- **THE TECHNOLOGY IS DESCRIBED IN A TECHNICAL REPORT AND IS AVAILABLE FOR IMPLEMENTATION.**



DRIVE SCISSORS ARM ASSEMBLY LOCATION

OCT 81

DARCOM MMT ACCOMPLISHMENT

NON DESTRUCTIVE TESTING

PROJECT NO: 3 74 3070 & 3 75 3070

**TITLE: NDT METHOD FOR SMALL COMPOSITE
ROCKET MOTOR COMPONENTS**

COST: \$220,000 TOTAL

RESULTS

- **COMPARED LASER HOLOGRAPHY, LOW FREQUENCY ULTRASONICS AND IMAGE ENHANCEMENT RADIOGRAPHY FOR NON DESTRUCTIVE TESTING.**
- **A COMBINATION OF IMAGE ENHANCEMENT RADIOGRAPHY AND LOW FREQUENCY ULTRASONICS WAS REQUIRED FOR A RELIABLE INSPECTION SYSTEM.**
- **A PROTOTYPE SYSTEM WAS DEVELOPED THAT HAS THE CAPABILITY OF INSPECTING ONE COMPLETE CARTRIDGE PER MINUTE AND ONE ASSEMBLED UNIT EVERY THIRTY SECONDS.**
- **SAVINGS FROM IMPLEMENTATION OF THIS EFFORT ARE ESTIMATED AT \$400,000 YEARLY.**



RADIOGRAPHIC NDT SYSTEM

OCT 81

DARCOM MMT ACCOMPLISHMENT

COMPOSITE ROCKET MOTOR PARTS

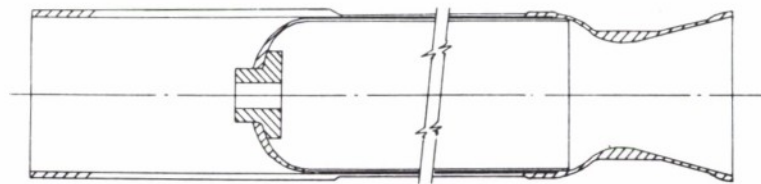
PROJECT NO: 3 75 3076

**TITLE: MASS PRODUCTION TECHNIQUES FOR
COMPOSITE ROCKET MOTOR COMPONENTS.**

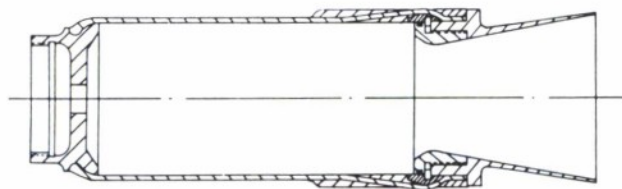
COST: \$175,000

RESULTS

- **A MANUFACTURING PROCESS FOR THE LIGHT-WEIGHT HIGH PERFORMANCE COMPOSITE ROCKET MOTOR IS BEING DEVELOPED. A PRODUCTION RATE OF 10,000 UNITS PER MONTH AT A 20% REDUCTION IN COST WAS ESTABLISHED AS A GOAL.**
- **THIS PROJECT DETERMINED THE PROCESSES REQUIRED TO PRODUCE TWO MOTOR DESIGNS.**
- **THE CASE-IN-CASE DESIGN WAS FOUND TO BE SIGNIFICANTLY LOWER IN COST THAN THE ONE-PIECE DESIGN.**
- **FOLLOW-ON PROJECTS WILL REFINE THE PROCESS FOR PRODUCING THE MOTORS.**



CASE-IN-CASE



ONE-PIECE CASE

COMPOSITE MOTOR CASES

OCT 81

DARCOM MMT ACCOMPLISHMENT

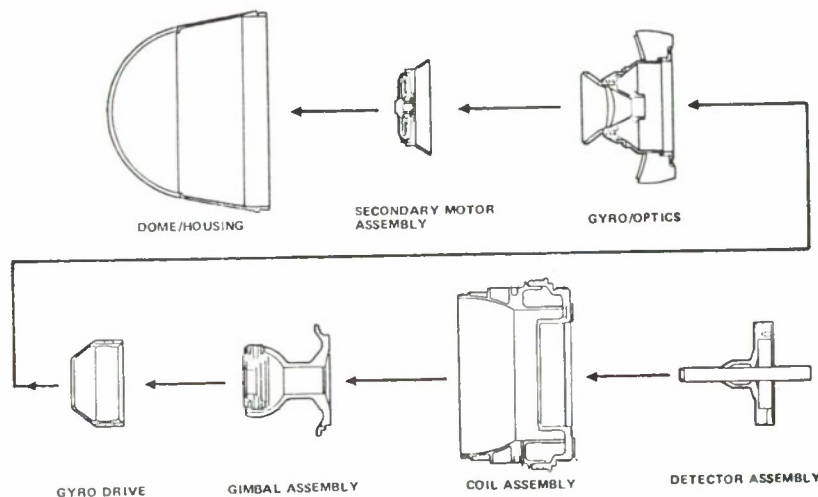
SEEKER ASSEMBLY

PROJECT NO: R 78 3116

TITLE: IMPROVED PRODUCTION METHOD FOR
THE ROSETTE AIR DEFENSE SEEKER
OPTICS AND DETECTOR

COST: \$536,000

RESULTS



STINGER-POST SEEKER HEAD

- THIS EFFORT ADDRESSES 14 SEPARATE AREAS CONTRIBUTING TO THE HIGH COST OF SEEKER ASSEMBLIES.
- THIS PORTION OF THE EFFORT ADDRESSED OPTICS, DETECTOR/PREAMPLIFIER AND SEEKER COMPONENTS.
- THE IMPROVED PROCESSES INCLUDED ULTRASONIC STAKING, INDUCTION SOLDERING, YAG LASER WELDING AND ADHESIVE BONDING.
- COMPLETION AND IMPLEMENTATION OF THIS EFFORT WILL RESULT IN ESTIMATED COST SAVINGS OF \$13.8 MILLION.

OCT 81

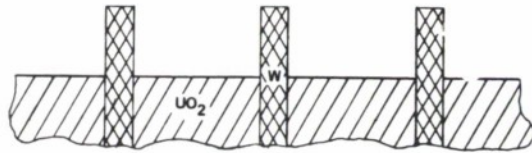
DARCOM MMT ACCOMPLISHMENT

FIELD EFFECT EMITTERS

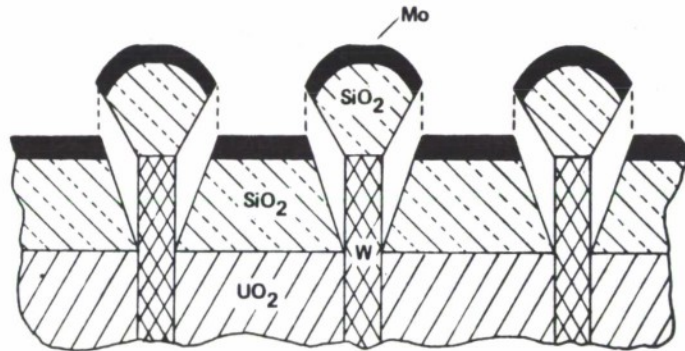
PROJECT NO: 3 75 3134 & R 77 3134

TITLE: MANUFACTURING METHODS FOR PRODUCTION OF FIELD EFFECT ELECTRON EMITTERS

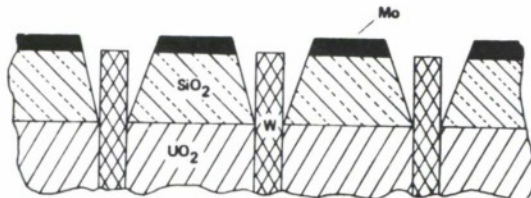
COST: \$275,000



STEP 1. ETCH TO PRODUCE FREE STANDING W PINS.



STEP 2. VAPOR DEPOSIT SiO2 AND Mo



STEP 3 AND 4. ULTRASONICALLY VIBRATE TO REMOVE CATHODE CONES AND CLEAN

LOW VOLTAGE FIELD EMITTER PROCESSING.

RESULTS

- MANUFACTURING PROCEDURES WERE DEVELOPED FOR FABRICATING MELT-GROWN OXIDE-METAL COMPOSITES FOR FIELD EFFECT ELECTRON EMITTING CATHODE STRUCTURES. THESE PROCEDURES SIGNIFICANTLY REDUCED FABRICATION COSTS.
- NEW METHODS FOR EMITTER FABRICATION USED COMMERCIALY AVAILABLE EQUIPMENT WHICH CUT COSTS APPRECIABLY.
- THE AREAS OF APPLICATION CAN INCLUDE THERMIONIC EMITTERS, GAS LASER DEVICES, INFRARED DEVICES AND ELECTRON BEAM WELDERS.

OCT 81

DARCOM MMT ACCOMPLISHMENT

COMPLIANT BEARINGS GYROS

PROJECT NO: R 78 3136

**TITLE: IMPROVED MANUFACTURING PROCESSES
FOR COMPLIANT BEARING GYROS**

COST: \$450,000



COPPERHEAD SEEKER HEAD

RESULTS

- **SEVERAL IMPROVEMENTS WERE INCORPORATED INTO THE GYRO ASSEMBLY TO INCREASE ITS MANUFACTURABILITY.**
- **TWO STEEL RINGS WERE ADDED TO THE ROTOR TO FACILITATE DYNAMIC BALANCING.**
- **A 4 CAVITY MOLD WAS DESIGNED THAT PERMITS INTERCHANGEABILITY OF PARTS AND RESULTED IN A LESS EXPENSIVE MOLDED MAGNET.**
- **CONTINUED REFINEMENT OF THE MANUFACTURING PROCESSES IS BEING ACCOMPLISHED THRU A FOLLOW-ON PROJECT.**
- **ESTIMATED COST SAVINGS UPON IMPLEMENTING THESE PROJECTS ARE \$960,000 PER YEAR.**

OCT 81

DARCOM MMT ACCOMPLISHMENT

MISSILE PRIMARY STRUCTURE

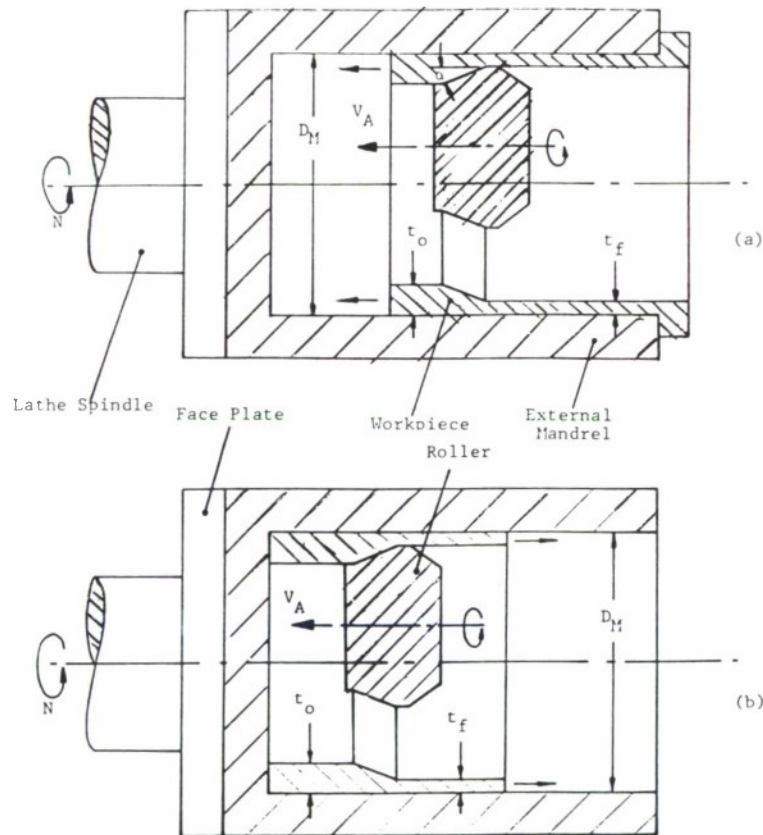
PROJECT NO: R 78 3204

TITLE: INTERNAL SHEAR FORGING PROCESSES
FOR MISSILE PRIMARY STRUCTURE

COST: \$314,000

RESULTS

- SAE 2014-0 ALUMINUM ALLOY WAS HOT ROLLED AT VARIOUS TEMPERATURES, SPEEDS AND ROLLING REDUCTIONS TO COMPARE THE MICROSTRUCTURES AND MECHANICAL PROPERTIES TO THE STARTING MATERIAL.
- BACKWARD SHEAR FORGING HAS BEEN SELECTED FOR FURTHER DEVELOPMENT IN THIS PROGRAM.
- ESTIMATED SAVINGS AS A RESULT OF COMPLETION AND IMPLEMENTATION OF THIS EFFORT ARE \$13.1 MILLION.



INTERNAL SHEAR FORGING PROCESS.

(A) FORWARD SHEAR FORGING, (B) BACKWARD SHEAR FORGING.

OCT 81

DARCOM MMT ACCOMPLISHMENT

HIGH SPEED MACHINING

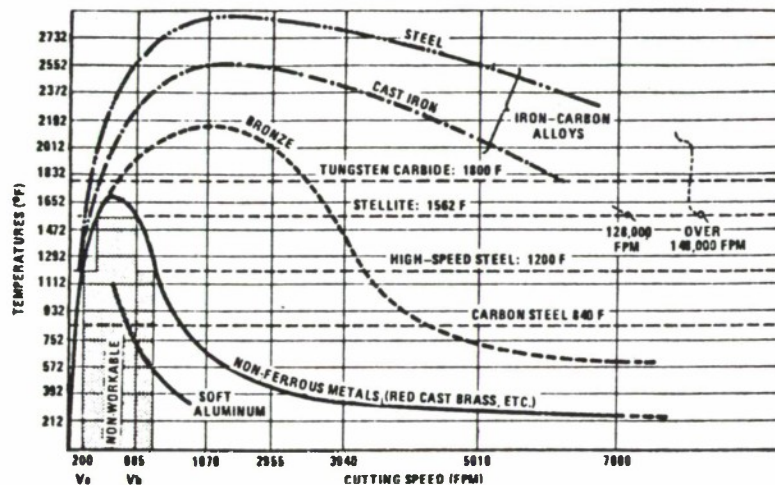
PROJECT NO: 3 76 3230

TITLE: MANUFACTURING METHODS FOR HIGH
SPEED MACHINING OF ALUMINUM

COST: \$242,000

RESULTS

- MAJOR IMPROVEMENTS IN PRODUCTIVITY AND COST EFFECTIVENESS WERE DEMONSTRATED FOR HIGH SPEED MACHINING PROCESSES.
- TESTING SHOWED NO THERMAL LIMIT TO THE CUTTING SPEED AT WHICH ALUMINUM CAN BE MACHINED.
- HIGH SPEED MACHINING SEEMS TO BE MOST ECONOMICAL FOR 'HOGGING' CUTS.
- THIS TECHNOLOGY IS BEING APPLIED TO MACHINE THE BODY SECTION OF THE NAVY'S TOMAHAWK MISSILE. SAVINGS OF \$6.1 MILLION ARE ESTIMATED FOR CURRENT PLANNED PRODUCTION.



EFFECT OF CUTTING SPEED
ON TEMPERATURE

OCT 81

DARCOM MMT ACCOMPLISHMENT

AUTOMATED PLATING

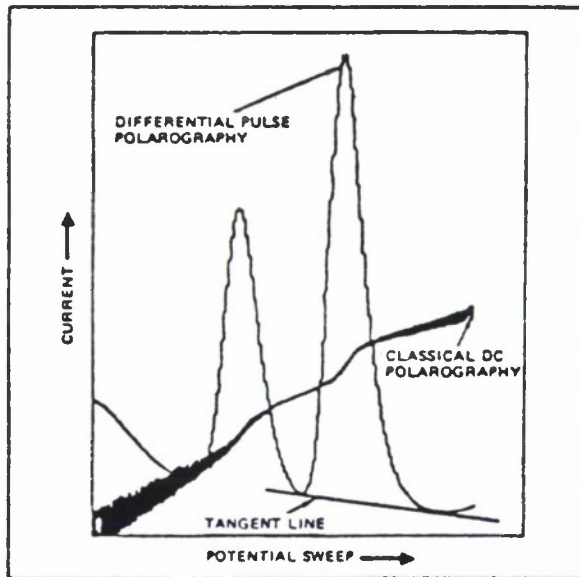
PROJECT NO: R 78 3268

TITLE: AUTOMATIC CONTROL OF PLATING (CAM)

COST: \$412,433

RESULTS

- **AN AUTOMATIC SENSING AND CONTROL SYSTEM HAS BEEN APPLIED TO THE TASK OF MAINTAINING THE CHEMISTRY OF PROCESSING SOLUTIONS IN A PRINTED BOARD PLATING LINE.**
- **A COMPUTERIZED POLARGRAPHIC ANALYZER IS USED FOR SIMULTANEOUS DETERMINATION OF 2 OR MORE CONSTITUENTS IN PROCESSING SOLUTIONS.**
- **THE SYSTEM DESIGN HAS BEEN COMPLETED AND INSTALLATION AND PROVEOUT INITIATED WITH A FOLLOW-ON EFFORT.**
- **COMPLETION AND IMPLEMENTATION OF THIS PROJECT WILL RESULT IN ESTIMATED SAVINGS OF \$450,000 PER YEAR.**



**COMPARISON OF DIFFERENTIAL
PULSE AND DC POLARGRAMS**

OCT 81

DARCOM MMT ACCOMPLISHMENT

TRACK PADS

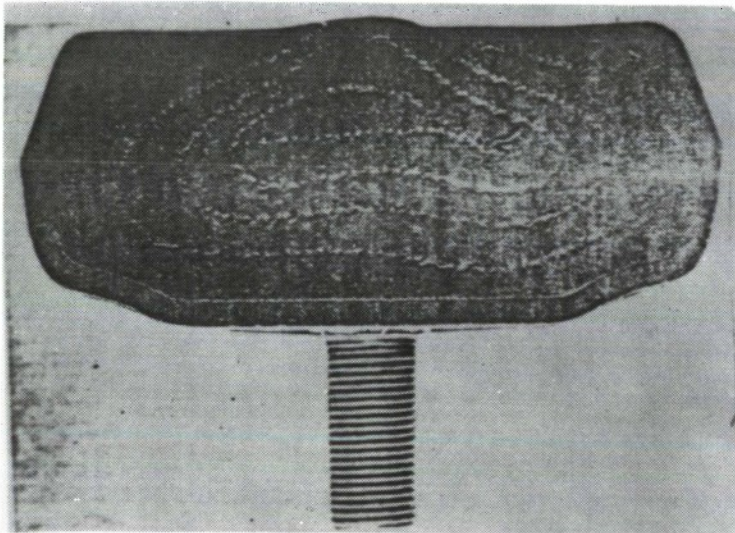
PROJECT NO: 4 74 4371

**TITLE: FABRICATION TECHNIQUES FOR TRACK
ELASTOMERIC COMPOUNDS**

COST: \$218,800

RESULTS

- **INVESTIGATED MATERIALS FOR EXTENDED LIFE TRACK PADS INCLUDED OIL EXTENDED POLYMERIZED STYRENE BUTADIENE RUBBER (SBR), OIL EXTENDED EMULSION SBR, NON-OIL EXTENDED EMULSION SBR AND POLYBUTADIENE.**
- **SAMPLE LOTS WERE FABRICATED AND TESTED**
- **ANALYSIS OF THE TEST RESULTS INDICATED THAT A 20 TO 30% IMPROVEMENT IN DURABILITY MAY BE POSSIBLE.**
- **THE RESULTS OF THIS PROJECT ARE BEING INCORPORATED INTO TRACK RUBBER SPECIFICATION MIL-T-11891.**



**CROSS SECTION OF VULCANIZED T142
RUBBER TRACK PAD CONTAINING WIRE CLOTH**

OCT 81

DARCOM MMT ACCOMPLISHMENT

LASER WELDING

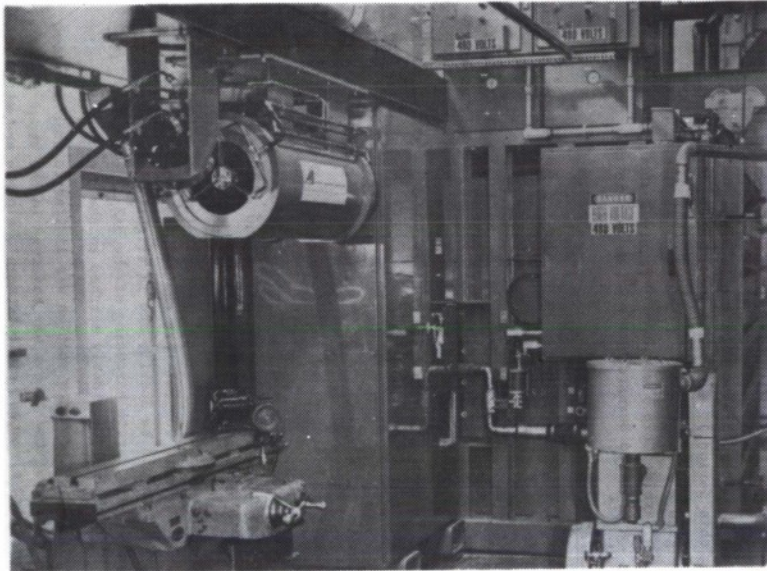
PROJECT NO: T 78 4575

**TITLE: LASER WELDING TECHNIQUES FOR
MILITARY VEHICLES-PHASE I**

COST: \$175,000

RESULTS

- **THIS PROJECT WAS THE FIRST PHASE OF A PROJECT TO DEVELOP LASER WELDING OF HEAVY ARMOR.**
- **INITIAL CONCLUSIONS DEVELOPED WERE:**
 - **NARROW GAP LASER WELDING REQUIRES ONLY ONLY ABOUT 30% AS MUCH FILLER MATERIAL DEPOSITION.**
 - **NARROW GAP LASER WELDING IS APPROXIMATELY 6 TIMES FASTER THAN SEMIAUTOMATIC GAS METAL ARC PROCESSES. THE SPEED IS INFLUENCED BY THE FILLER WIRE DIAMETER.**
 - **FOLLOW-ON PROJECTS ARE COMPLETING THIS EFFORT. ESTIMATED ANNUAL SAVINGS AS A RESULT OF COMPLETING AND IMPLEMENTING THIS EFFORT ARE \$140,000.**



LASER WELDING STATION

DARCOM MMT ACCOMPLISHMENT

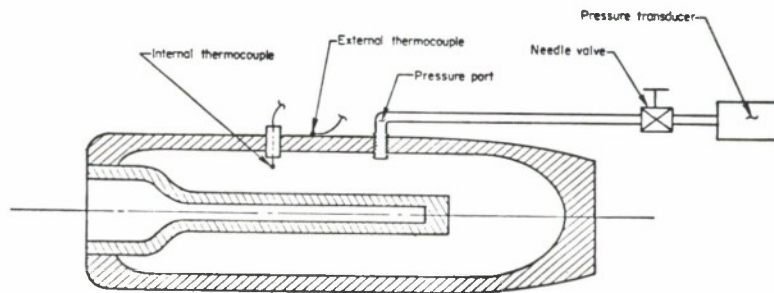
LEAK TESTING

PROJECT NO: 5 75 1250

**TITLE: EVALUATION AND PROVEOUT OF WP
MUNITIONS LEAK DETECTION PROTOTYPE**

COST: \$325,000

RESULTS



**THERMOCOUPLE AND
PRESSURE-PORT LOCATION**

- **A PROTOTYPE IN-LINE LEAK DETECTION SYSTEM FOR WHITE PHOSPHOROUS FILLED MUNITIONS WAS DEVELOPED AND TESTED.**
- **THE SYSTEM HEATS THE ROUND INDUCTIVELY TO INCREASE ITS INTERNAL PRESSURE. LEAKAGE IS THEN DETERMINED BY A THERMAL/FLAME EMISSION DETECTION SYSTEM.**
- **THIS EFFORT WILL RESULT IN A LEAK DETECTION METHOD WHICH WILL SHORTEN THE TEST TIME REQUIRED, REDUCE ENERGY COSTS, AND ELIMINATE VISUAL OBSERVATION.**

DARCOM MMT ACCOMPLISHMENT

SUPPRESSIVE SHIELDING

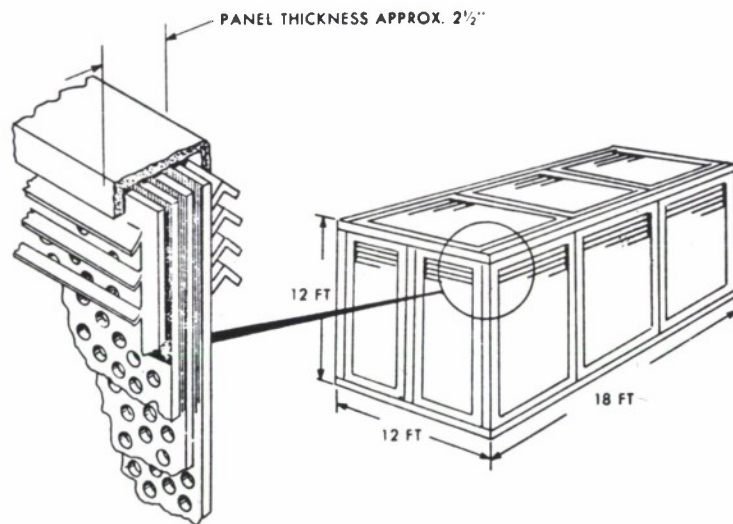
**PROJECT NO: 5 73 1264, 5 74 1264, 5 75 1264
5 76 1264 & 5 7T 1264**

**TITLE: ADVANCED TECHNOLOGY FOR SUP-
PRESSIVE SHIELDING OF HAZARDOUS
PRODUCTION AND SUPPLY OPERATIONS.**

**COST: \$524,000; \$1,500,000; \$3,300,000;
\$1,450,000 & \$100,000**

RESULTS

- **THIS PROJECT PROVIDED SUPPRESSIVE SHIELDING DESIGNS FOR THE ARMY MODERNIZATION PLAN.**
- **FIVE SHIELDS EFFECTIVE AGAINST BLAST AND FRAGMENT EFFECTS HAVE BEEN TESTED AND SAFETY CERTIFIED.**
- **THE PROJECT WAS DEFERRED FROM ITS MAJOR OBJECTIVE OF PROVIDING A SHIELD TO WITHSTAND A 3500 LB EXPLOSIVE CHARGE BECAUSE OF A CHANGE IN MODERNIZATION/EXPANSION PLANS.**
- **A GROUP SHIELD WAS IMPLEMENTED AT IOWA AAP THAT RESULTED IN A \$2 MILLION COST AVOIDANCE.**



**81-MM MORTAR LINE
SUPPRESSIVE SHIELD**

DARCOM MMT ACCOMPLISHMENT

SMOKE GRENADES

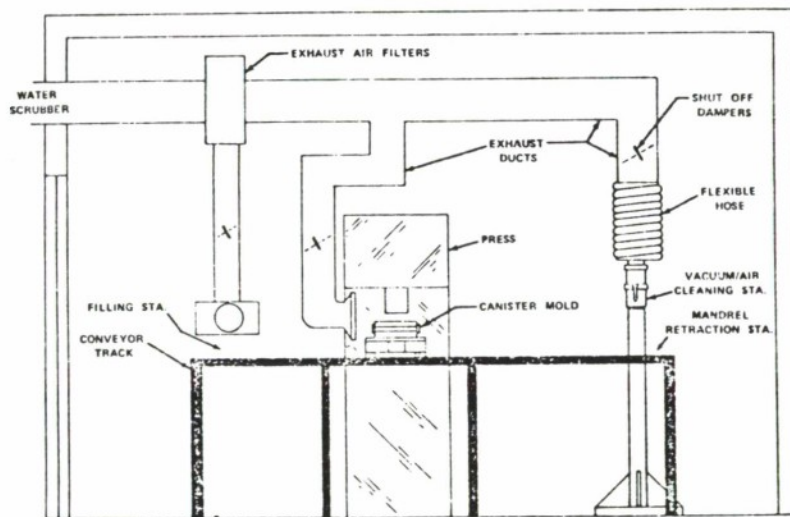
PROJECT NO: 5 75 1316

TITLE: ADVANCED TECHNOLOGY FOR PROCESSING SMOKE GRENADES

COST: \$500,000

RESULTS

- DEVELOPED THE ESSENTIAL TECHNOLOGY AND PROCEDURES TO ECONOMICALLY, SAFELY AND RELIABLY FILL AND PRESS HIGH QUALITY GRENADES.
- COST REDUCTIONS WERE ACHIEVED THROUGH ELIMINATION OF OPERATIONS AND OPERATORS.
- SAFETY AND HYGIENE IMPROVEMENTS
- REDUCED POLLUTION ABATEMENT COSTS THROUGH CONTROL OF MATERIALS
- IMPLEMENTATION OF THIS PROJECT AT PINE BLUFF ARSENAL WILL RESULT IN ESTIMATED COST SAVINGS OF \$750,000 PER YEAR.



**GRENADE TILLING, PRESSING, AND
CLEANING STATIONS**

DARCOM MMT ACCOMPLISHMENT

FUZE SENSITIVITY MEASUREMENT

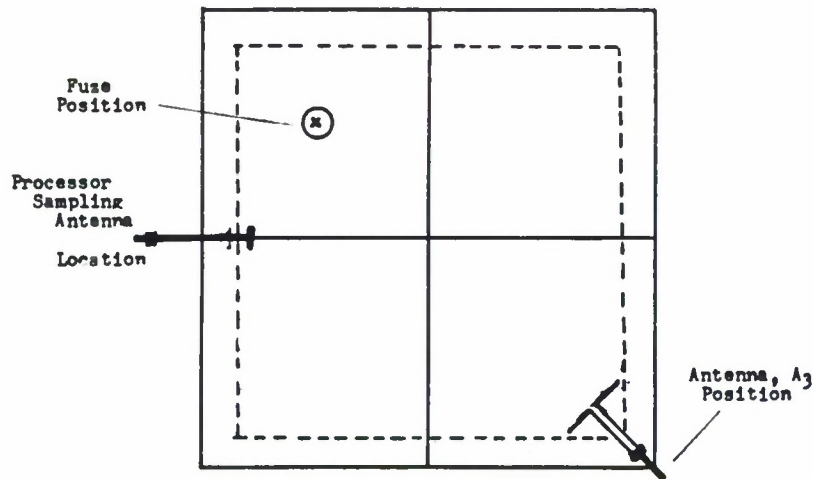
PROJECT NO: 5 73 3048 & 5 74 3048

TITLE: OSCILLATOR SENSITIVITY MEASUREMENT
TECHNIQUE

COST: \$150,000

RESULTS

- THESE PROJECTS ASSEMBLED A PROXIMITY FUZE SENSITIVITY TESTER USING STANDARD LABORATORY EQUIPMENT AND AN ANECHOIC CHAMBER.
- THE EFFORT DEMONSTRATED THAT 100% TESTING OF PROXIMITY FUZE SENSITIVITY CAN BE PERFORMED IN A PRODUCTION ENVIRONMENT USING AN OSCILLATOR SENSITIVITY MEASUREMENT TECHNIQUE.
- THE SYSTEM IS CURRENTLY BEING USED BY HDL TO SUPPORT PROXIMITY FUZE WORK.

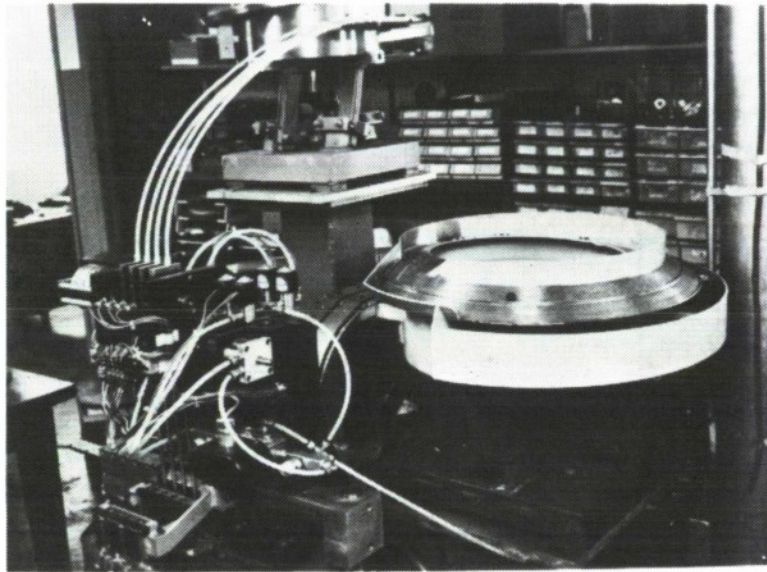


ANECHOIC CHAMBER ANTENNA AND
FUZE TEST POSITIONS

OCT 81

DARCOM MMT ACCOMPLISHMENT

MINIATURE BEARING & SHAFT ASSEMBLY



MAGNET FEEDER SYSTEM

PROJECT NO: 5 76 3127, 5 7T 3127 & 5 77 3127

TITLE: MINIATURE BEARINGS AND SHAFT MANUFACTURING ASSEMBLY PROCESSES

**COST: \$220,000, \$90,000 & \$215,000
RESPECTIVELY**

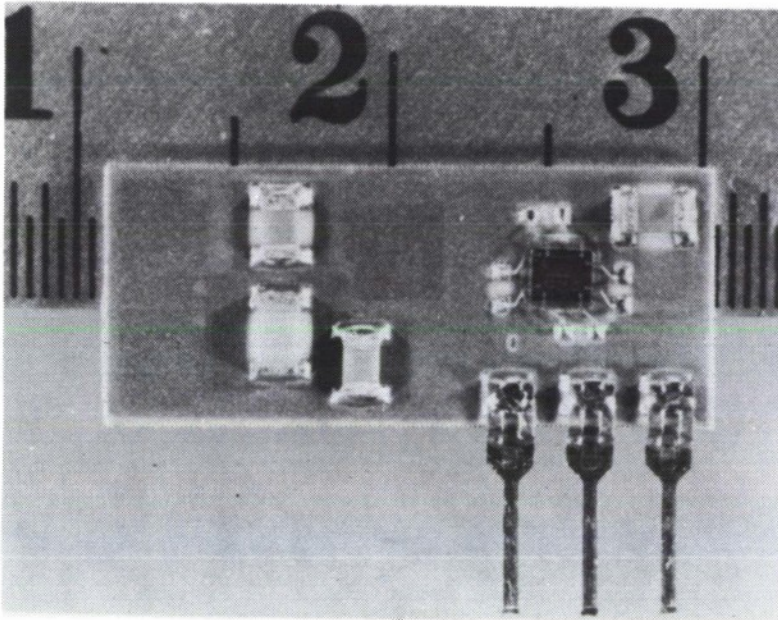
RESULTS

- **FULL SCALE PRODUCTION MACHINES WERE BUILT TO PRODUCE THE ALTERNATOR SHAFT, MAGNET, HOUSING, BEARING, AND END PLATES.**
- **THE EQUIPMENT WAS TRANSFERRED TO AN INITIAL PRODUCTION FACILITY AND WILL BE USED TO PRODUCE TURBOALTERNATORS FOR THE M734 FUZE.**
- **A COST SAVINGS OF \$1.50 PER TURBO-ALTERNATOR HAS BEEN ACHIEVED AND A PRODUCTION CAPABILITY OF ONE MILLION UNITS PER YEAR HAS BEEN PROVIDED.**

OCT 81

DARCOM MMT ACCOMPLISHMENT

THICK FILM HYBRIDS



**THICK FILM HYBRID
OSCILLATOR CIRCUIT**

PROJECT NO: 5 77 3947 & 5 78 3947

**TITLE: THICK FILM HYBRID CIRCUITS FOR
XM587E2/XM724 FUZES**

COST: \$150,000 & \$556,000

RESULTS

- **THIS PROJECT ESTABLISHED LARGE SCALE INEXPENSIVE MANUFACTURING TECHNIQUES FOR THE FUSE OSCILLATOR CIRCUIT AND INTERFACE AND FIRING CIRCUIT.**
- **A PRODUCTION RATE OF 650 DEVICES PER HOUR WAS DEMONSTRATED FOR BOTH CIRCUITS.**
- **SIGNIFICANT COST REDUCTIONS FOR LARGE QUANTITIES SEEMS ATTAINABLE.**
- **UPON IMPLEMENTATION IT IS ESTIMATED THAT THE ANNUAL SAVINGS WOULD EXCEED \$14 MILLION AT THE PLANNED PRODUCTION RATE.**

OCT 81

DARCOM MMT ACCOMPLISHMENT

PROPELLING CHARGE INCREMENTS

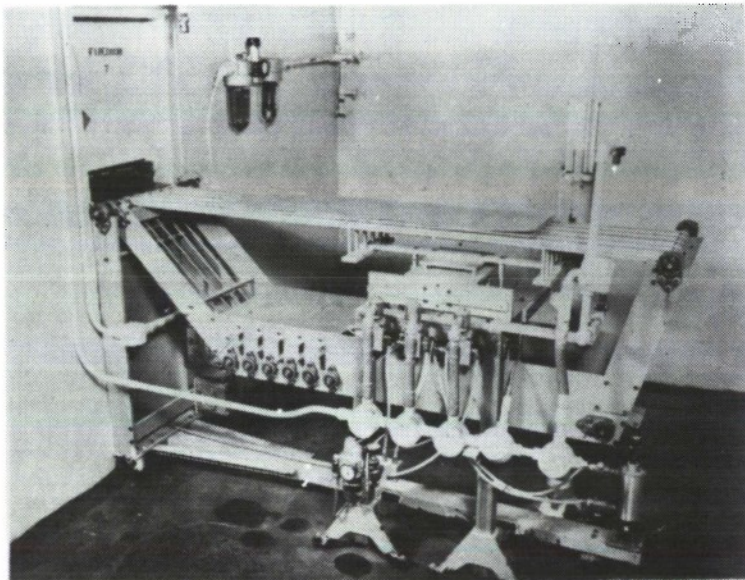
PROJECT NO: 5 73 4012 & 5 75 4012

**TITLE: CONTINUOUS FINAL ROLL MILL AND PAD
MAKE-UP MACHINE FOR MORTAR INCRE-**
MENTS

COST: \$1,300,000 & \$699,000

RESULTS

- **THIS PROJECT WAS TO CHANGE THE MANUFACTURING PROCESS FOR PROPELLING CHARGES FROM A BATCH TO A CONTINUOUS OPERATION.**
- **THE GOAL WAS TO PROVIDE A SAFER LINE THAT REQUIRED 40 FEWER OPERATING PERSONNEL.**
- **A PRODUCTION LINE WAS DESIGNED AND CONSTRUCTED HOWEVER THE FUNDING WAS DEPLETED BEFORE THE LINE BECAME OPERATIONAL.**
- **FOLLOW-ON PROJECTS WILL BE INITIATED TO COMPLETE THIS EFFORT. ESTIMATED ANNUAL SAVINGS ARE \$145,000 WHEN THIS PROJECT IS IMPLEMENTED.**



**INCREMENT PAD ON
CHECKWEIGHER CONVEYOR**

DARCOM MMT ACCOMPLISHMENT

CONTINUOUS PROCESSING

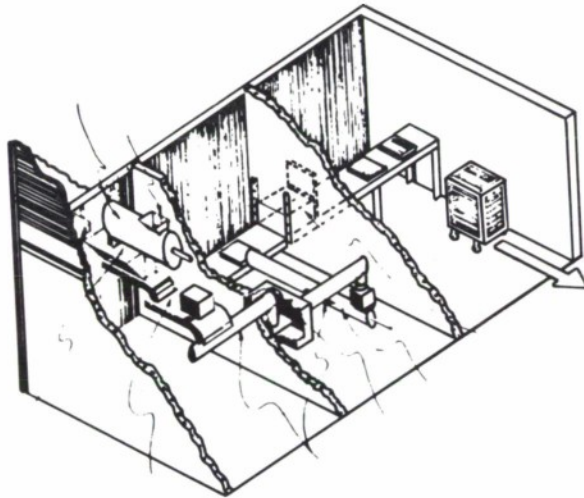
PROJECT NO: 5 72 4015, 5 73 4015 & 5 75 4015

**TITLE: ESTABLISHMENT OF A PROTOTYPE
SYSTEM FOR THE CONTINUOUS PROCESS-
ING OF BENITE**

COST: \$350,000, \$100,000 & \$190,000

RESULTS

- **A PROTOTYPE CONTINUOUS PROCESS FOR PRODUCING BENITE WAS DEVELOPED TO REPLACE THE LABOR INTENSIVE AND POTENTIALLY HAZARDOUS BATCH PROCESS.**
- **A COMMERCIAL BLENDING AND SCREW TYPE EXTRUDER PROVIDED A CONTINUOUS EXTRUDING CAPABILITY. A RUBBER BELT CONVEYOR WAS USED TO MOVE THE BENITE BETWEEN THE BLENDER AND THE EXTRUDER. AS THE MATERIAL IS EXTRUDED IT IS CUT INTO STRAIGHT CYLINDERS WITH A HIGH PRESSURE FLUID JET.**
- **A MARKED REDUCTION IN THE REQUIREMENT FOR BENITE HAS MADE THE AUTOMATED PROCESS UNECONOMICAL.**



PROPOSED FACILITY

OCT 81

DARCOM MMT ACCOMPLISHMENT

AUTOMATED LOAD & ASSEMBLY

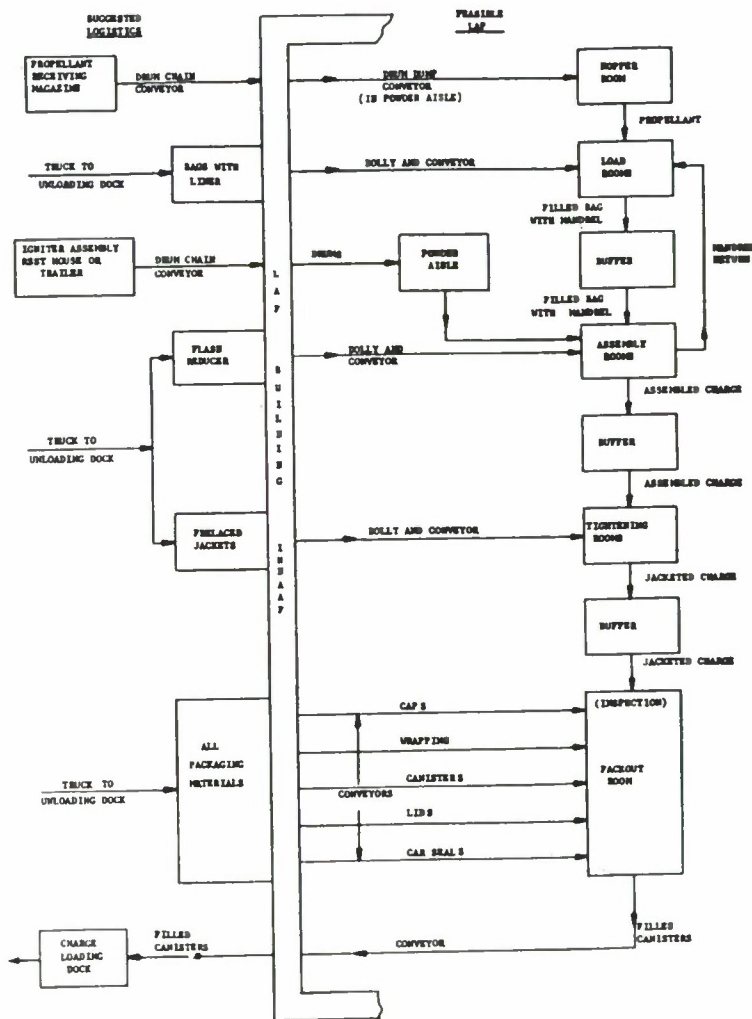
PROJECT NO: 5 73 4105 & 5 74 4105

TITLE: AUTOMATED INCREMENT LOADING AND ASSEMBLY OF PROPELLING CHARGES WITH CENTRAL CORE IGNITERS.

COST: \$105,000 & \$477,000

RESULTS

- THIS PHASE FURNISHED THE SYSTEM CONCEPT FOR MODERNIZING THE LOAD, ASSEMBLE AND PACK OF THE PROPELLING CHARGE.
- THE CONCEPT PROPOSES A SEMI-AUTOMATED SYSTEM SINCE FULL AUTOMATION WOULD BE TOO COMPLEX.
- THIS EFFORT IS CONTINUING UNDER LATER FISCAL YEAR PROJECTS.
- COMPLETION AND IMPLEMENTATION OF THESE PROJECTS WILL RESULT IN ESTIMATED SAVINGS OF \$3.1 MILLION ANNUALLY.



CENTER CORE IGNITER CHARGE
LAP AUTOMATION

OCT 81

DARCOM MMT ACCOMPLISHMENT

COMBUSTIBLE CASE PROCESSING

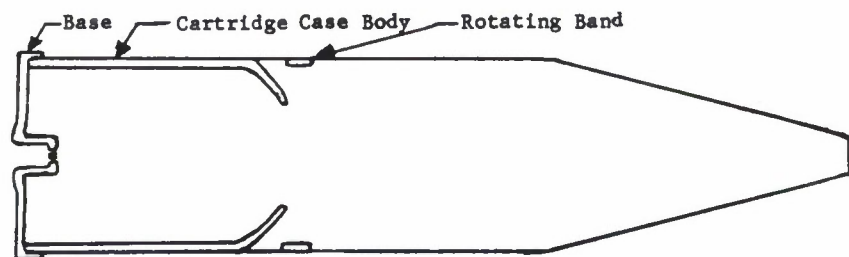
PROJECT NO: 5 70 4109

TITLE: IMPROVED PROCESS FOR THE MANUFACTURE OF NON-METALLIC CARTRIDGE CASE

COST: \$399,000

RESULTS

- **AN IN HOUSE CAPABILITY FOR PILOT PRODUCTION OF NON-METALLIC CARTRIDGE CASES WAS ESTABLISHED.**
- **WET FELTS WERE FORMED AND WERE FOUND TO BE SATISFACTORY FOR WASHOUT AND UNEVEN WALL THICKNESS.**
- **THE PROJECT DEVELOPED THE TECHNICAL DATA FOR PRODUCTION CONTRACTS.**

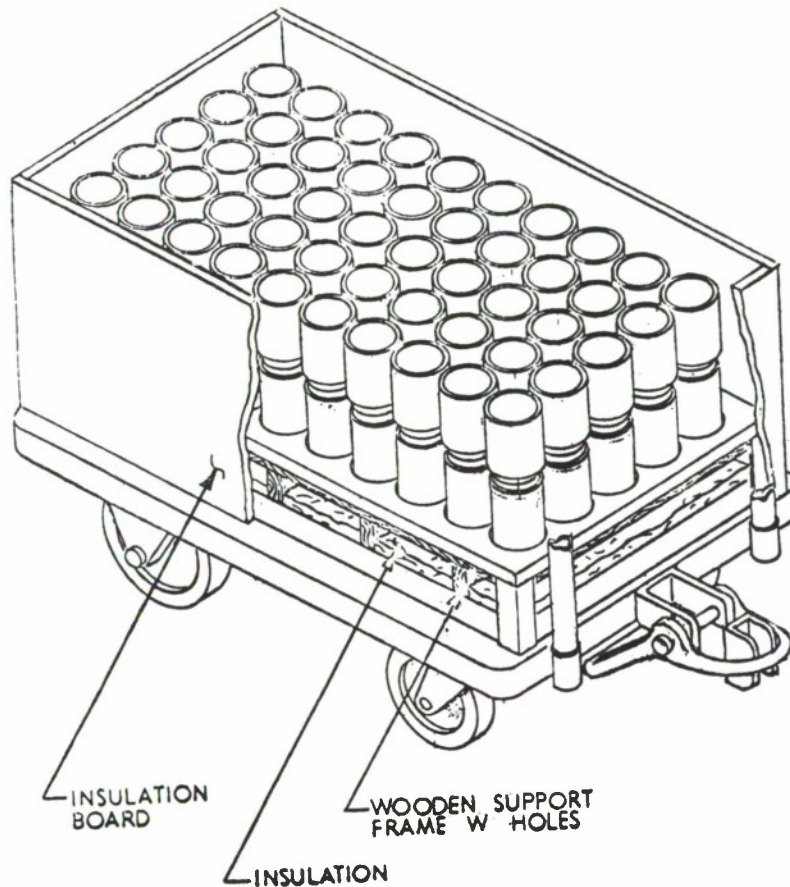


M205 COMBUSTIBLE CARTRIDGE CASE

OCT 81

DARCOM MMT ACCOMPLISHMENT

PROJECTILE EXPLOSIVE LOADING



PROJECTILE CARRIER

PROJECT NO: 5 78 4163

**TITLE: CONTROLLED PRODUCTION LOADING
SYSTEM FOR 105MM HEAT-T M456A1**

COST: \$187,480

RESULTS

- **THE PURPOSE OF THIS PROJECT WAS TO INCREASE THE YIELD OF THE 105MM HEAT-T, M456A1 PROJECTILE CASTING PROCESS. REJECT RATES OF 30 TO 50% WERE BEING EXPERIENCED.**
- **PART OF THE PROBLEM WAS FOUND TO BE A TOO RAPID COOLING RATE RESULTING IN CRACKS IN THE EXPLOSIVE. THE PROCESS WAS MODIFIED AND THE REJECT RATE WAS REDUCED TO 25%.**
- **A FOLLOW-ON PROJECT IS EXPECTED TO FURTHER REDUCE THE REJECT RATE TO 5%.**

DARCOM MMT ACCOMPLISHMENT

AUTOMATED PROCESSING

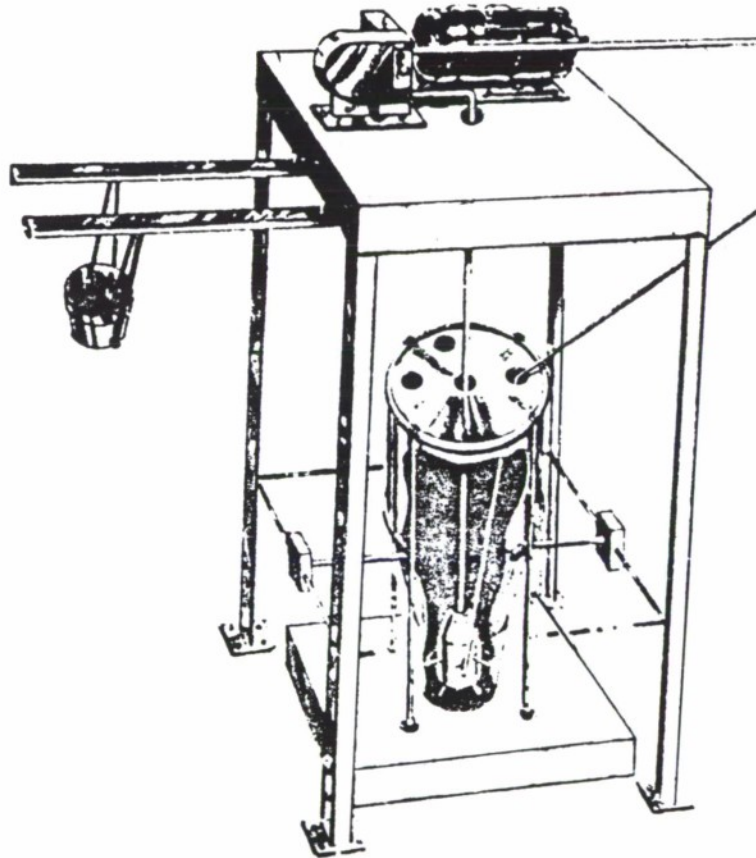
PROJECT NO: 5 71 4173 & 5 72 4173

**TITLE: AUTOMATED MATERIAL PROCESSING IN A
DETONATOR BACKLINE**

COST: \$400,000 & \$150,000

RESULTS

- **THESE PROJECTS RESULTED IN A SYSTEM TO REMOTELY WASH, DRY, SCREEN AND DISPENSE EXPLOSIVE IN ONE-OUNCE INCREMENTS WITHIN 2 HOURS.**
- **THE SYSTEM HAS SATISFACTORILY PROCESSED LEAD AZIDE, LEAD STYPHNATE AND TETRACENE.**
- **THE RESULTS WERE EVALUATED DURING THE DESIGN OF P AND Q BACKLINES AT LONE STAR ARMY AMMUNITION PLANT BUT AN ALTERNATIVE TECHNOLOGY WAS FOUND TO BE MORE ECONOMICAL.**



TURBULATOR SYSTEM

OCT 81

DARCOM MMT ACCOMPLISHMENT

AUTOMATED ASSEMBLY

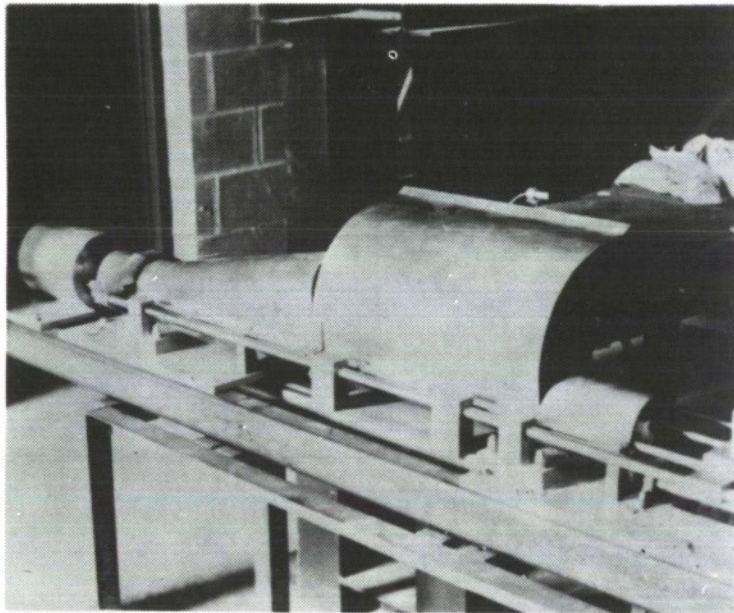
PROJECT NO: 5 73 4216 & 5 74 4216

**TITLE: AUTOMATED 105MM CARTRIDGE CASE
ASSEMBLY**

COST: \$70,000 & \$390,000 RESPECTIVELY

RESULTS

- **A STANDARD BAGGING MACHINE WAS PURCHASED AND MODIFIED TO ACCEPT THE PROPELLING CHARGES. THE CHARGES ARE INDIVIDUALLY PACKAGED INTO "BAGGIES" AND PLACED IN SHIPPING CONTAINERS AT A RATE OF 45 CHARGES PER MINUTE.**
- **THE SECOND PHASE OF THE PROGRAM DEVELOPED AN AUTOMATED CARTRIDGE CASE LOADER.**
- **THIS MACHINE TAKES THE PREPACKAGED CHARGES AND LOADS THE 105MM CASES AT A RATE OF 25 PER HOUR.**
- **IMPLEMENTATION OF THIS PROJECT WOULD RESULT IN FEWER OPERATORS AND FEWER ENTANGLEMENT PROBLEMS.**



CARTRIDGE CASE LOADER

OCT 81

DARCOM MMT ACCOMPLISHMENT

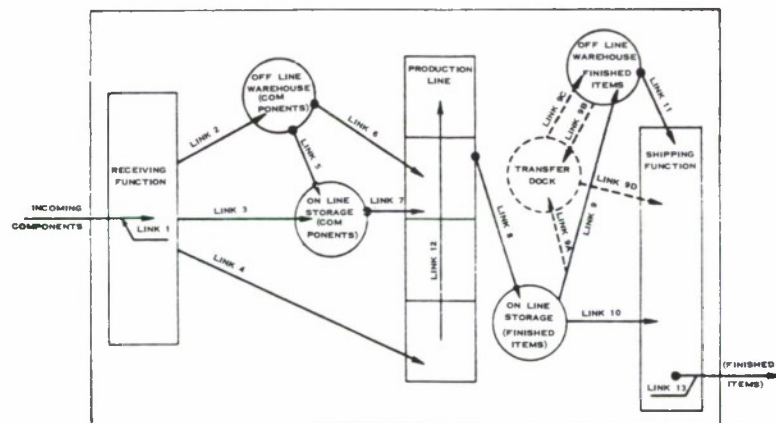
MODERNIZED MATERIAL HANDLING

PROJECT NO: 5 71 4218 & 5 72 4218

TITLE: MODERNIZATION OF MATERIALS
HANDLING AT LAP FACILITIES

COST: \$200,000 & \$992,000

RESULTS



MATERIALS FLOW THRU A LAP PLANT

- THE PURPOSE OF THESE PROJECTS WAS TO IDENTIFY AREAS OF IMPROVEMENT IN MATERIALS HANDLING AT AMMUNITION PLANTS. SEVENTY PRODUCTION LINES AND ELEVEN LOAD, ASSEMBLE, AND PACK PLANTS WERE REVIEWED. AREAS IDENTIFIED BY THIS STUDY INCLUDE...
- A PACKAGING CHANGE FOR THE 2.75 ROCKET WITH A POTENTIAL \$210,000 YEARLY SAVINGS.
- INCREASED USE OF PALLETIZATION WITH A POTENTIAL \$1,444,000 YEARLY SAVINGS.

OCT 81

DARCOM MMT ACCOMPLISHMENT

DELUGE FIRE EXTINGUISHING SYSTEM

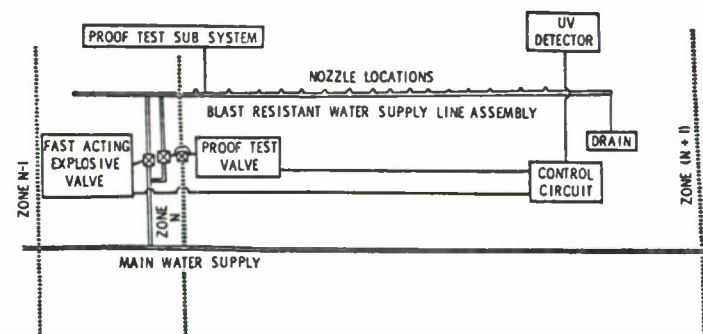
PROJECT NO: 5 75 4245

TITLE: DEVELOPMENT OF A DELUGE SYSTEM TO EXTINGUISH FIRES FOLLOWING AN ACCIDENTAL DETONATION ON CONVEYORS HANDLING BULK HIGH EXPLOSIVE

COST: \$175,000

RESULTS

- **A SYSTEM UTILIZING COMMERCIALY AVAILABLE COMPONENTS WAS DESIGNED AND TESTED.**
- **THE SYSTEM IS ACTIVATED BY A ULTRAVIOLET DETECTOR AND ASSOCIATED LOGIC. WATER SUPPLY LINES ARE BURIED ADJACENT TO THE CONVEYOR FOR BLAST PROTECTION.**
- **INCREASES SAFETY AND REDUCES POTENTIAL LOSS.**
- **APPLICATIONS USING THE BASIC DESIGN HAVE BEEN INSTALLED AT BADGER, LONESTAR, INDIANA AND LOUISIANA ARMY AMMUNITION PLANTS.**



PROTOTYPE WATER DELUGE SYSTEM

DARCOM MMT ACCOMPLISHMENT

SAFETY TESTING

PROJECT NO: 5 7T 4285

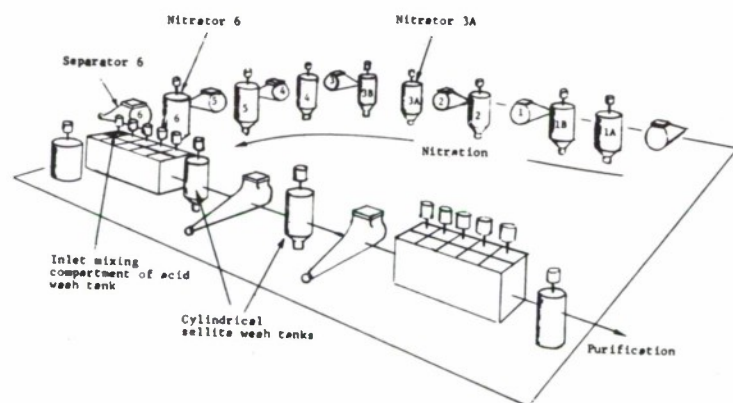
TITLE: TNT EQUIVALENCY TESTING IN SUPPORT
OF SAFETY ENGINEERING FOR AMMU-
NITION PLANTS

COST: \$81,000

RESULTS

- DETERMINED THE EXPLOSIVE AIR BLAST FOR SEVEN CHEMICAL MIXTURES OF IN-PROCESS MATERIALS THAT ARE PRESENT ON A TNT LINE.
- THE RESULTS WERE CONVERTED TO TNT EQUIVALENCY FOR USE WITH AMCR 385-100 AND TM5-1300.
- BOTH SMALL SCALE TESTS AND LIMITED LARGE SCALE TESTS WERE PERFORMED TO VERIFY THE RESULTS.

OCT 81



**TNT NITRATION &
PURIFICATION SYSTEM**

DARCOM MMT ACCOMPLISHMENT

SAFETY TESTING

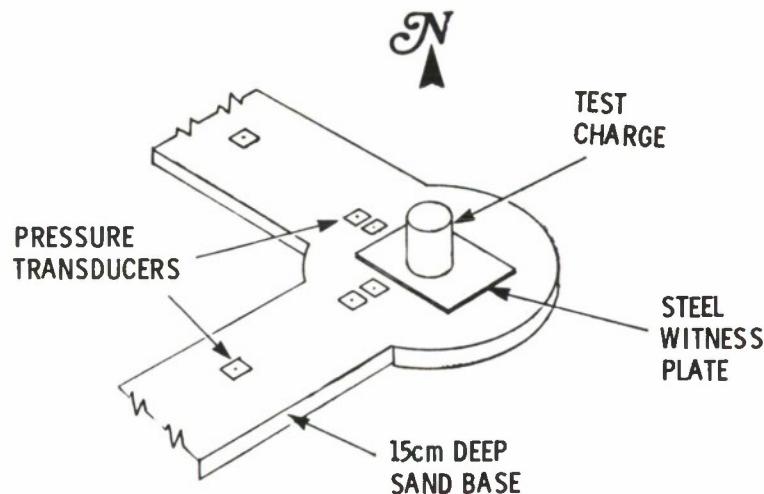
PROJECT NO: 5 77 4285

**TITLE: TNT EQUIVALENCY TESTING IN SUPPORT
OF SAFETY ENGINEERING FOR AMMUNITION
PLANTS**

COST: \$377,600

RESULTS

- **THE PURPOSE OF THESE TESTS WAS TO DETERMINE THE TNT EQUIVALENCY OF BENITE, TRACER COMPOSITION, IGNITER MIX, AND SUBIGNITER MIX.**
- **THIS DATA COMBINED WITH AMCR 385-100 AND TM5-1300 DATA WILL ENABLE THE DESIGN OF PROTECTIVE FACILITIES THAT WILL RESIST THE BLAST EFFECTS OF AN ACCIDENTAL DETONATION.**
- **THE RESULTS WERE PUBLISHED IN TECHNICAL REPORTS.**



TEST ARRAY AND CHARGE PLACEMENT

OCT 81

DARCOM MMT ACCOMPLISHMENT

SAFETY TESTING

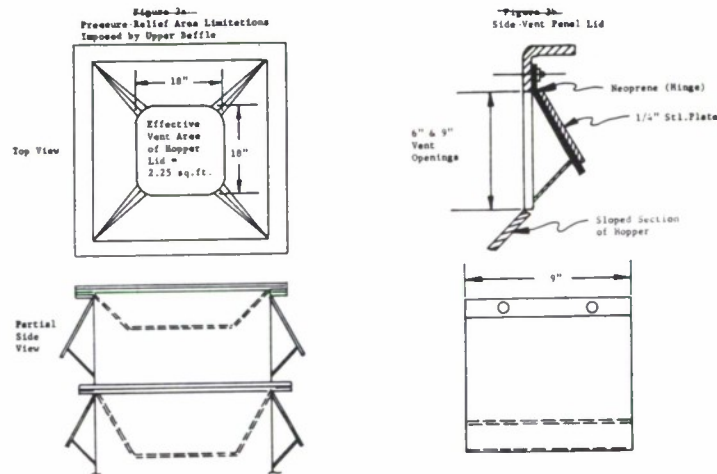
PROJECT NO: 5 77 4289

TITLE: HAZARD CLASSIFICATION STUDIES OF
EXPLOSIVES AND PROPELLANTS

COST: \$306,000

RESULTS

- THIS PROJECT PROVIDED DESIGN DATA TO INCREASE THE SAFETY OF THE CONTINUOUS AUTOMATED SINGLE-BASE LINE (CASBL) AT RADFORD AAP.
- A HOPPER DESIGN INCORPORATING PRESSURE RELIEF VENTING WAS PROPOSED TO PREVENT DESTRUCTIVE PRESSURE BUILDUP.
- THE PROPOSED DESIGN CHANGES WERE INCORPORATED INTO THE CONSTRUCTION OF THE CASBL AND CAMBL FACILITIES AT RADFORD AAP.



PROPOSED HOPPER DESIGN

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DARCOM MMT ACCOMPLISHMENT

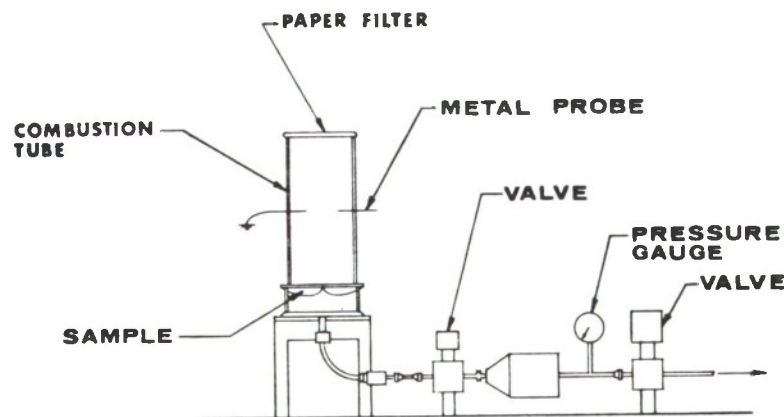
SAFETY TESTING

PROJECT NO: 5 78 4289

**TITLE: HAZARD CLASSIFICATION STUDIES OF
PROPELLANTS AND EXPLOSIVES**

COST: \$214,000

RESULTS



**HARTMANN DUST EXPLOSIBILITY
TEST APPARATUS**

- THE SENSITIVITY EVALUATION CAN BE COMPLETED DURING THE LABORATORY SCALE PHASE OF PROCESS DEVELOPMENT.
- A SYSTEMATIC MEANS OF DETERMINING THE HAZARD CLASSIFICATION OF MATERIALS WAS DEVELOPED FOR USE IN CONSTRUCTING SAFER MUNITIONS MANUFACTURING FACILITIES.
- A STEP BY STEP PROCEDURE WAS ESTABLISHED THAT RESULTS IN PLACING THE MATERIAL IN CATEGORIES RANGING FROM VERY INSENSITIVE TO MASS EXPLOSION HAZARD. THIS CLASSIFICATION IS THEN USED TO DETERMINE APPROPRIATE FACILITY AND EQUIPMENT DESIGNS.

OCT 81

DARCOM MMT ACCOMPLISHMENT

SAFETY TESTING

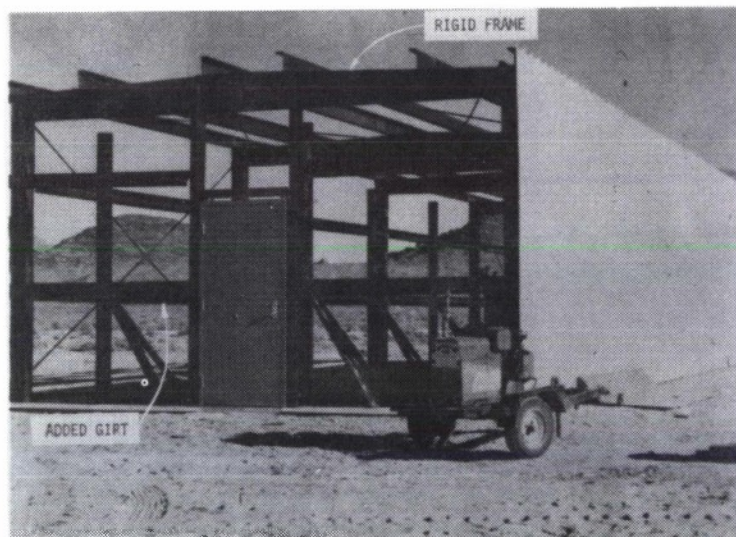
PROJECT NO: 5 77 4291

TITLE: BLAST EFFECTS IN THE MUNITION PLANT ENVIRONMENT

COST: \$338,193

RESULTS

- **METHODS FOR REDUCING THE BLAST EFFECTS ON PRE-ENGINEERED BUILDINGS WERE DEVELOPED.**
- **THE CURRENT STRUCTURES WILL WITHSTAND OVER-PRESSURES OF 0.5 PSI.**
- **BY INCREASING THE BUILDING COST BY APPROXIMATELY 20% THE BLAST RESISTANCE CAN BE INCREASED 4 TIMES TO 2 PSI.**
- **TECHNICAL REPORTS RESULTING FROM THIS PROJECT ARE BEING INCORPORATED INTO THE SAFETY DOCUMENT TM5-1300.**



**PRE-ENGINEERED BUILDING
UNDER CONSTRUCTION**

OCT 81

DARCOM MMT ACCOMPLISHMENT

PROPELLANT BAG LOADING

PROJECT NO: 5 76 4443

**TITLE: UPGRADE PERFORMANCE OF BAG
BUFFER, MANDREL-CLAMSHELL INTER-
FACE AND INSPECTION SENSOR EQUIP-
MENT FOR 105MM, M67 PROPELLING
CHARGE**

COST: \$150,000

RESULTS

- **IMPROVEMENTS WERE MADE TO THE 105MM-M67
LOADING BOOTH AT INDIANA ARMY AMMO PLANT.**
- **THE PICKUP AND INSERTION OF BAGS INTO THE
CAROUSEL WAS IMPROVED BY THE INSTALLATION
OF NEW SENSORS. OVERALL ECONOMY AND
CAROUSEL PERFORMANCE WILL BE BETTER AND
DOWN TIME WILL BE REDUCED DUE TO THE
IMPROVEMENTS.**
- **MODIFICATIONS RESULTING FROM THIS PROJECT
WERE INCLUDED IN THE TECHNICAL DATA
PACKAGE FOR THE BAG LOADING OPERATIONS.**



PROPELLANT DISPENSER

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DARCOM MMT ACCOMPLISHMENT

MATH MODELLING

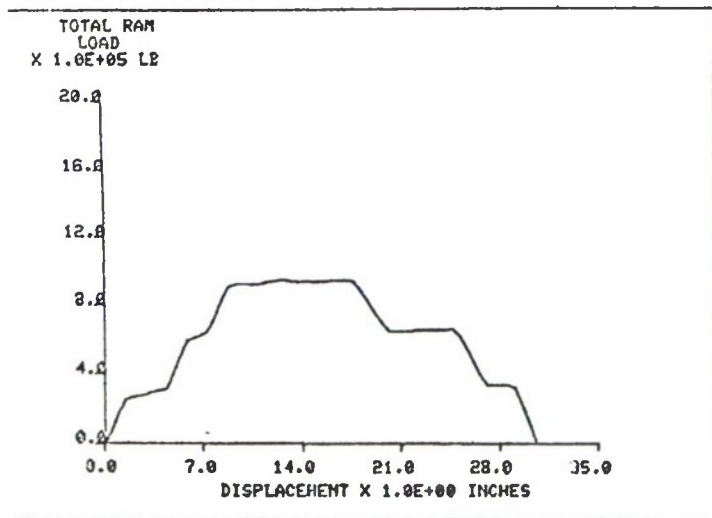
PROJECT NO: 5 77 6716

TITLE: DEVELOPMENT OF MATH MODELS OF
FORMING OPERATIONS FOR CURRENT/
FUTURE ARTILLERY METAL PARTS
DESIGNS (CAD/CAM)

COST: \$295,000

RESULTS

- A COMPUTER DIAGNOSTIC TOOL WAS DEVELOPED TO REDUCE THE ENGINEERING TIME CONSUMED IN TECHNICAL DATA PACKAGE PREPARATION FOR TOOLING, EQUIPMENT AND SETUP.
- PICTORIAL REPRESENTATIVES OF THE PUNCH AND BILLET DISPLACEMENTS, THE TOTAL RAM LOAD AND WALL STRESS ARE DISPLAYED ON A CRT.
- THE COMPUTER PROGRAM, "DRAWING", IS OPERATIONAL ON THE ARRADCOM COMPUTER SYSTEM.
- THE FORECAST REDUCTION IN TDP PREPARATION TIME WILL ALSO IMPROVE READINESS.



RAM FORCE VS STROKE

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DARCOM MMT ACCOMPLISHMENT

FLOW TURNING AND PEELING

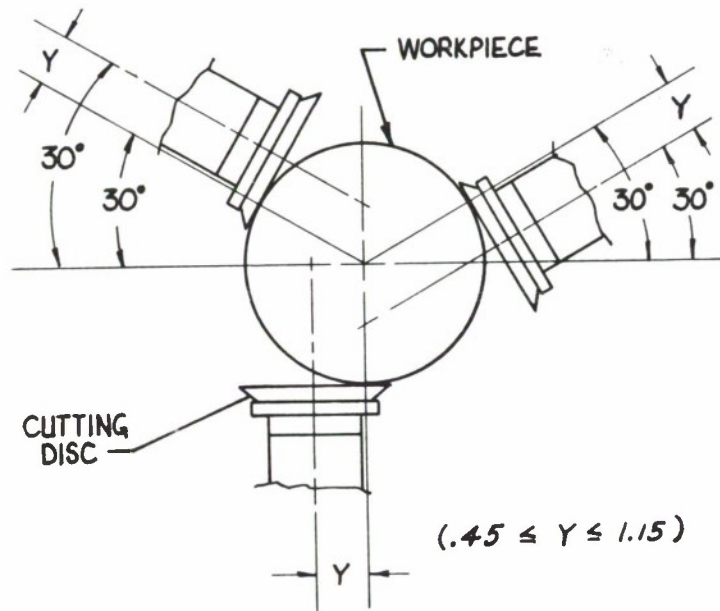
PROJECT NO: 6 71 6915 & 6 72 6915

TITLE: APPLICATION OF FLOW TURNING AND
PEELING TO THE SHAPING OF CYLINDRICAL
WEAPON COMPONENTS

COST: \$75,000 & \$80,000

RESULTS

- THIS PROJECT EVALUATED OPPOSED MULTIPLE-TOOL FLOW-TURNING, ROTARY-SHEAR PEELING, MILLING AND ABRASIVE MACHINING FOR USE ON SMALL ARMS BARRELS AND RECOIL CYLINDERS.
- FLOW TURNING WAS ABLE TO DEMONSTRATE ADVANTAGES AND EFFICIENCIES HOWEVER, FOR EFFECTIVE APPLICATION MORE RIGID MACHINE TOOLS WOULD BE REQUIRED.
- NO IMPLEMENTATION IS PLANNED.



3 DISCS POSITION - FLO-TURNING

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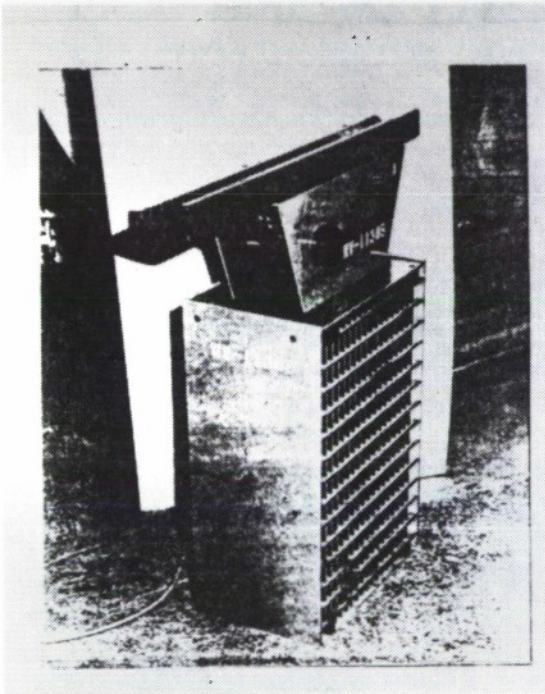
DARCOM MMT ACCOMPLISHMENT

IMPROVED BENCHING OPERATIONS

PROJECT NO: 6 71 7028

**TITLE: MECHANIZED BENCHING OF CANNON
COMPONENTS**

COST: \$70,800



HELD EDGE GRINDER

RESULTS

- **MECHANIZATION OF SOME HAND BENCHING OPERATIONS WAS PERFORMED TO REDUCE COSTS AND INCREASE CONSISTENCY OF THE OPERATIONS.**
- **A HARPERIZER WAS SELECTED FOR DEBURRING AND EDGE CHAMFERING LARGE HEAVY COMPONENTS SUCH AS THE BREECH RING FOR THE 105MM, M137.**
- **A HELD EDGE GRINDER IS USED FOR OTHER PARTS SUCH AS THE 8 INCH AND 175MM RAIL.**
- **TIME SAVINGS OF 1.7 HOURS PER COMPONENT FOR THE BREECH RING AND 0.25 HOURS FOR THE RAILS HAVE BEEN REALIZED.**

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DARCOM MMT ACCOMPLISHMENT

ABRASIVE MACHINING

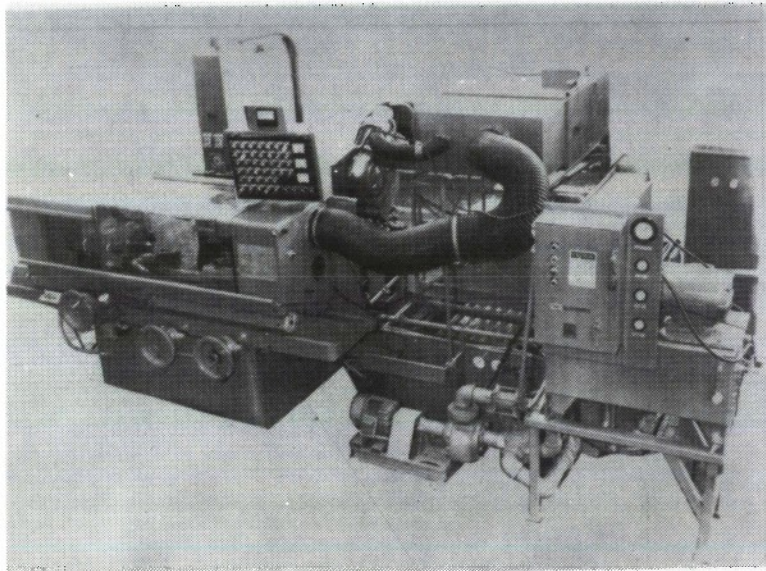
PROJECT NO: 6 71 7030

**TITLE: ABRASIVE MACHINING OF MINOR ITEMS
FOR CANNON MANUFACTURING**

COST: \$239,000

RESULTS

- **THE OBJECTIVE OF THIS PROJECT WAS TO DEMONSTRATE A COST REDUCTION AND PART QUALITY IMPROVEMENT POSSIBLE WITH ABRASIVE MACHINING. THE ABRASIVE TECHNIQUE WAS HIGHLY COMPETITIVE AND ALLOWED MACHINING OF HARDENED STEELS.**
- **IMPLEMENTATION OF THIS METHOD FOR THE BREECH COMPONENTS OF THE M68 AND M113 CANNONS SHOULD RESULT IN A \$65,000 YEARLY SAVINGS. SAVINGS FOR TEST SPECIMEN GRINDING IS ESTIMATED AT \$348,000 YEARLY.**



ABRASIVE GRINDING EQUIPMENT

OCT 81

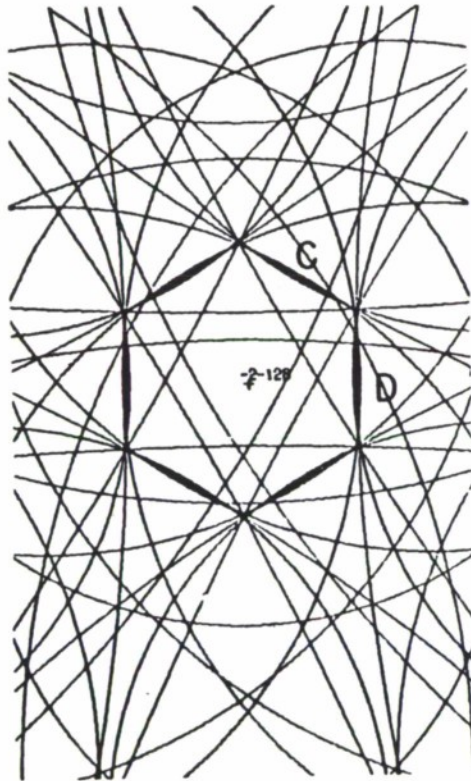
DARCOM MMT ACCOMPLISHMENT

LASER MATERIAL EVALUATION

PROJECT NO: 6 71 7061

**TITLE: MATERIAL EVALUATION TECHNIQUES FOR
LASER CHARACTERISTICS BY THE X-RAY**

COST: \$75,000



**KOSSEL PATTERN SHOWING
EXPECTED EFFECT
OF 1% HYDROSTATIC STRAIN**

RESULTS

- **FOUR METHODS OF LASER MATERIAL EVALUATION
WERE STUDIED AS FOLLOWS:**
 - **LAUE PHOTOGRAPHY**
 - **CHEMICAL ETCHING AND ETCH PITS**
 - **PRECISION ALIGNMENT USING CHARACTERISTIC
X-RADIATION**
 - **KOSSEL PATTERNS**
- **THE KOSSEL METHOD WAS FOUND TO PROVIDE A
SENSITIVE AND RAPID METHOD OF ASSESSING
BOULE QUALITY.**

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DARCOM MMT ACCOMPLISHMENT

CANNON BORE HONING

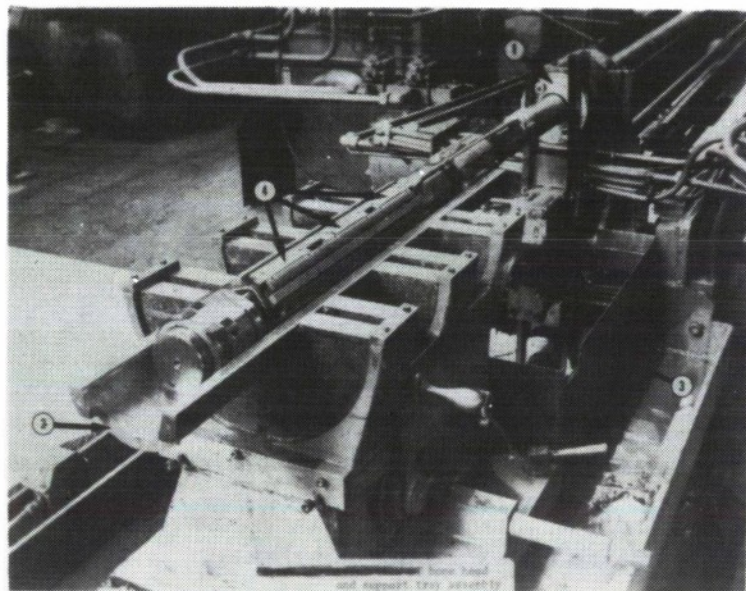
PROJECT NO: 6 76 7241

**TITLE: IMPROVEMENT OF HONING EQUIPMENT
AND PROCEDURES**

COST: \$178,000

RESULTS

- **USING SWAGE AUTOFRETTAGE FOR BARRELS REQUIRED AN UPGRADING OF THE HONING THE PROJECT DEVELOPED A:**
- **NEW FEED SYSTEM AND HONE HEAD FOR INCREASING THE METAL REMOVAL RATES.**
- **FASTER INDUCTION GAGING SYSTEM TO REPLACE THE STAR GAGES.**
- **IMPROVED CUTTING FLUID CONTROL SYSTEM.**
- **HONING TIME PER BARREL WILL BE REDUCED BY 1.3 HOURS WHEN THIS PROJECT IS IMPLEMENTED.**



**HONE HEAD AND SUPPORT
TRAY ASSEMBLY**

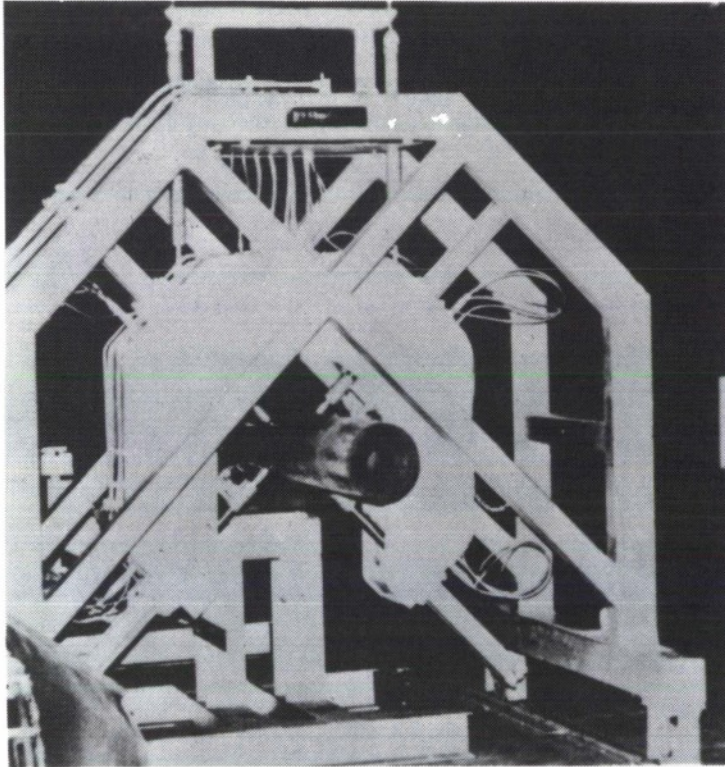
OCT 81

SECTION III

IMPLEMENTED EFFORTS

DARCOM MMT IMPLEMENTATION

CANNON TUBE WALL THICKNESS MEASUREMENT



WALL THICKNESS MEASUREMENT SYSTEM

PROJECT NO: M 76 6350 SUBTASK 1831

**TITLE: HOT FORGING WALL VARIATION
MEASUREMENTS**

COST: \$80,000

BENEFITS

- **DEVELOPED AN ULTRASONIC BASED SYSTEM THAT MEASURES THE WALL THICKNESS OF HOT PRODUCTION FORGINGS.**
- **THIS METHOD PRECLUDES CONTINUED PRODUCTION OF OUT OF SPECIFICATION PARTS THAT COULD OCCUR IF INSPECTION IS DELAYED UNTIL THE FORGINGS HAVE COOLED.**
- **THE SYSTEM IS CURRENTLY BEING USED FOR INSPECTING 105MM (M68) TUBES. SAVINGS ARE ESTIMATED TO BE \$180,000 PER YEAR.**

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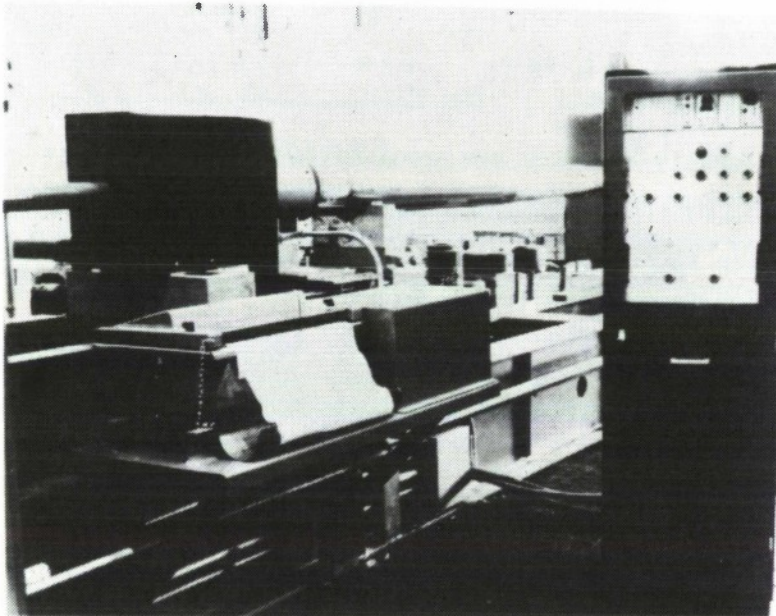
DARCOM MMT IMPLEMENTATION

LASER INSPECTION

PROJECT NO: M 77 6350 - 1849

TITLE: LASER SCAN INSPECTION SYSTEM

COST: \$80,000



LASER SCAN INSPECTION SYSTEM

BENEFITS

- **DEVELOPED A RAPID AUTOMATED METHOD OF INSPECTING THE BORES OF CANNON TUBES FOR CRACKS, INCLUSIONS AND DISCONTINUITIES.**
- **INCLUDES A MAGNETIC PARTICLE BASED SYSTEM THAT USES LASER LIGHT REFLECTED FROM THE INNER BORE ONTO A PHOTODETECTOR.**
- **A FLAW IN THE BORE IS INDICATED BY A CHANGE IN THE PHOTODETECTOR OUTPUT. THE FLAW LOCATION IS AUTOMATICALLY RECORDED FOR SUBSEQUENT VISUAL INSPECTION.**
- **THE SYSTEM IS CURRENTLY BEING USED TO INSPECT 105MM, M68 CANNON TUBES WITH ESTIMATED SAVINGS OF \$20,000 YEARLY.**

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DARCOM MMT IMPLEMENTATION

CONDUCTIVE PLASTIC RATIO METER

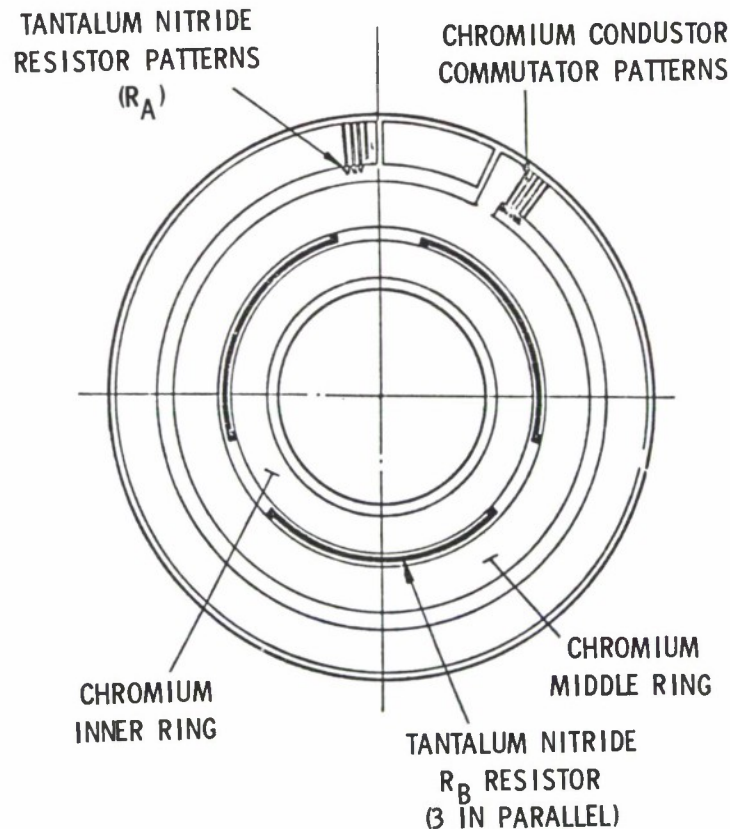
EFFORT NO: 2 71 9500

TITLE: TIME SETTING POTENTIOMETER FOR
SHORT INTRUSION PROXIMITY FUZE

COST: \$158,000

BENEFITS

- TECHNIQUES WERE ESTABLISHED FOR THE MANUFACTURE AND QUALITY CONTROL OF A TIME SETTING POTENTIOMETER
- A LIQUID ADHESIVE SYSTEM WAS PROPOSED THAT WOULD REPLACE THE LABOR INTENSIVE ADHESIVE PREFORM METHOD FOR CEMENTING THE SUBSTRATE TO THE DETONATOR BLOCK.
- A MULTI-TINED MOVABLE CONTRACT WAS PROPOSED TO INCREASE DEVICE RELIABILITY.
- AS A RESULT OF IMPLEMENTING THESE TECHNIQUES A \$1.9 MILLION SAVINGS WAS REALIZED.



**RATIOMETER
RESISTOR & CONDUCTOR
PATTERN**

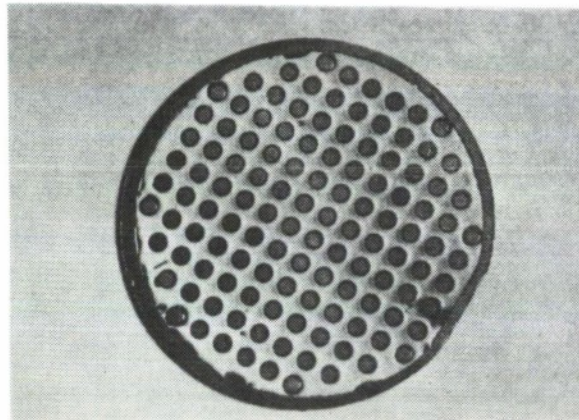
DARCOM MMT IMPLEMENTATION

PIN DIODES

EFFORT NO: H 73 9526

**TITLE: LOW LOSS HI RELIABILITY INTEGRATABLE
PIN DIODES**

COST: \$350,000



GLASS PASSIVATED WAFER

BENEFITS

- **A CAPACITY FOR ECONOMICALLY PRODUCING GLASS PASSIVATED UNPACKAGED PIN DIODE CHIPS WAS DEVELOPED.**
- **THE DIODES ARE RUGGED AND REPRODUCIBLE AND THE CONFIGURATION MAKES THEM IDEALLY SUITED FOR AUTOMATED CIRCUIT FABRICATION.**
- **A MAXIMUM OUTPUT OF 130,000 FULLY TESTED CHIPS CAN EASILY MEET THE GOAL OF 30,000 UNITS PER MONTH.**
- **ESTIMATED 10 YEAR SAVINGS AS A RESULT OF IMPLEMENTING THIS PROJECT IS \$2.9 MILLION.**

AUG 81

DARCOM MMT IMPLEMENTATION

INTEGRATION OF CAD/CAM

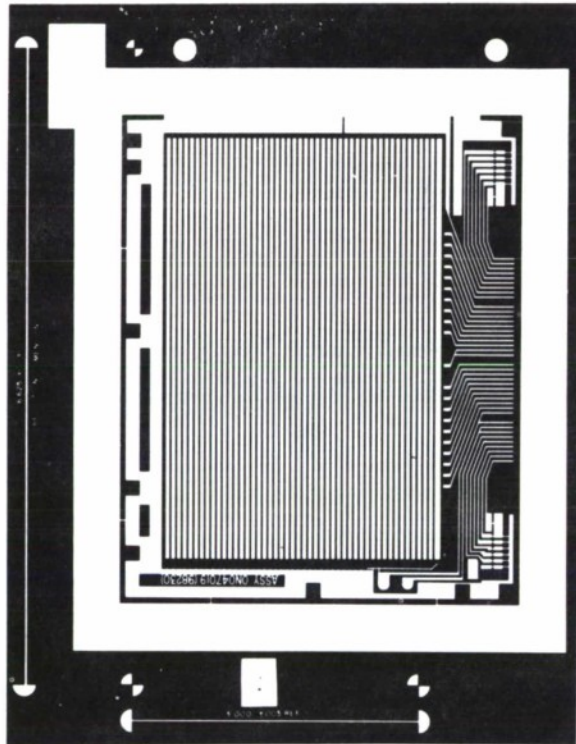
EFFORT NO: 2 7X 9641

TITLE: DEVELOPMENT OF CAD/CAM INTERFACE
FOR COMMUNICATIONS AND ELEC—
TRONICS PACKAGES.

COST: \$200,000

BENEFITS

- INTERFACE COMPUTER PROGRAMS WERE WRITTEN AND A PAPER TAPE CONNECTION WAS MADE TO LINK AN AUTOMATIC DRAFTING DIGITIZING SYSTEM TO AN INTERACTIVE GRAPHICS SYSTEM.
- THE INTEGRATED SYSTEM RESULTED IN A REDUCTION OF COST FOR THE DESIGN AND FABRICATION OF DISTRIBUTED PARAMETER MICROWAVE DEVICES AND MULTILAYER PRINTED CIRCUIT BOARDS.



ARTWORK MASTER LAYER 1

DARCOM MMT IMPLEMENTATION

PRECISION CASTING

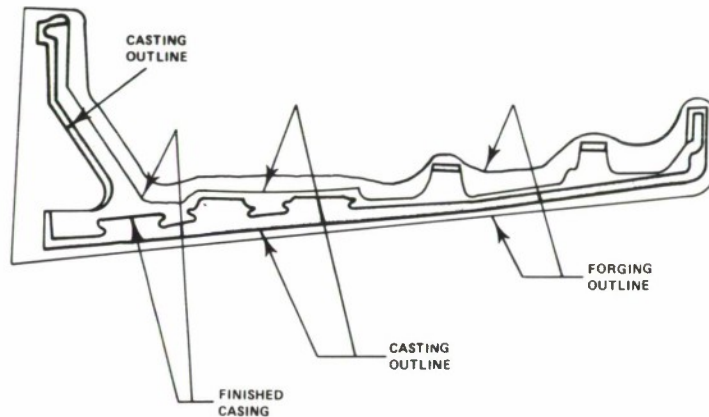
EFFORT NO: 1 7X 7046

TITLE: PRECISION CAST TITANIUM COMPRESSOR CASING

COST: \$502,000

BENEFITS

- A PROCESS TO PRECISION CAST ONE-PIECE TITANIUM COMPRESSOR CASINGS WAS DEVELOPED. THIS WAS PREVIOUSLY PRODUCED FROM A FORGING WHICH HAD TWO CASING HALVES ARRANGED END TO END.
- THE NEAR NET SHAPE CASTING RESULTED IN A 35LB MATERIAL SAVINGS AND A 30 HOUR LABOR SAVINGS.
- THE PROCESS WAS IMPLEMENTED ON T-700 ENGINE PRODUCTION AND RESULTED IN A \$922/UNIT SAVINGS, OR \$5.4 MILLION OVER A 10 YEAR PERIOD.



**T700 COMPRESSOR CASTING
VS FORGING**

DARCOM MMT IMPLEMENTATION LASER DESIGNATORS

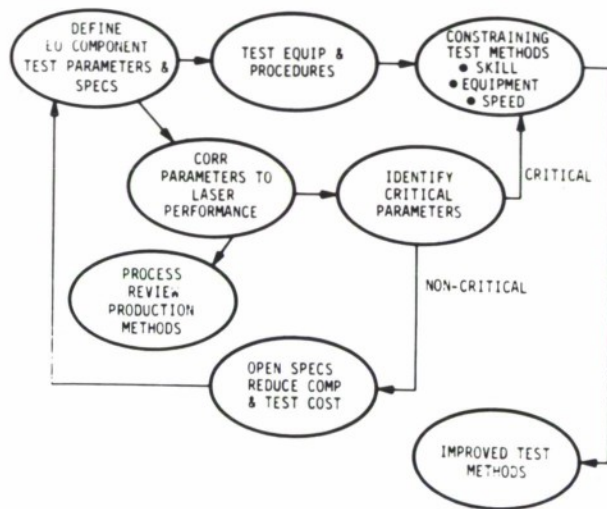
EFFORT NO: 3 7X 3119

TITLE: PRODUCTION METHODS FOR LASER
GUIDANCE DESIGNATORS.

COST: \$350,000

BENEFITS

- THIS PROJECT ESTABLISHED COST EFFECTIVE PRODUCTION AND TESTING METHODS FOR ELECTRO-OPTICAL COMPONENTS USED IN LASER DESIGNATORS.
- TWENTY TWO COMPONENTS WERE CATEGORIZED AS TO INDIVIDUAL TEST PARAMETERS, SPECIFICATIONS AND TOLERANCE.
- SIX IMPROVED TEST METHODS THAT SUBSTITUTED DYNAMIC TESTS FOR STATIC TESTS REDUCED TEST TIME BY APPROXIMATELY 50%.
- IMPLEMENTATION OF THESE METHODS WILL RESULT IN COST SAVINGS OF \$1.7 MILLION OVER A 5 YEAR PRODUCTION SPAN.



FLOW DIAGRAM FOR PROCESS REVIEW
OF PRODUCTION TEST METHODS

DARCOM MMT IMPLEMENTATION

LEVEL MEASURING

EFFORT NO: 5 75 1261

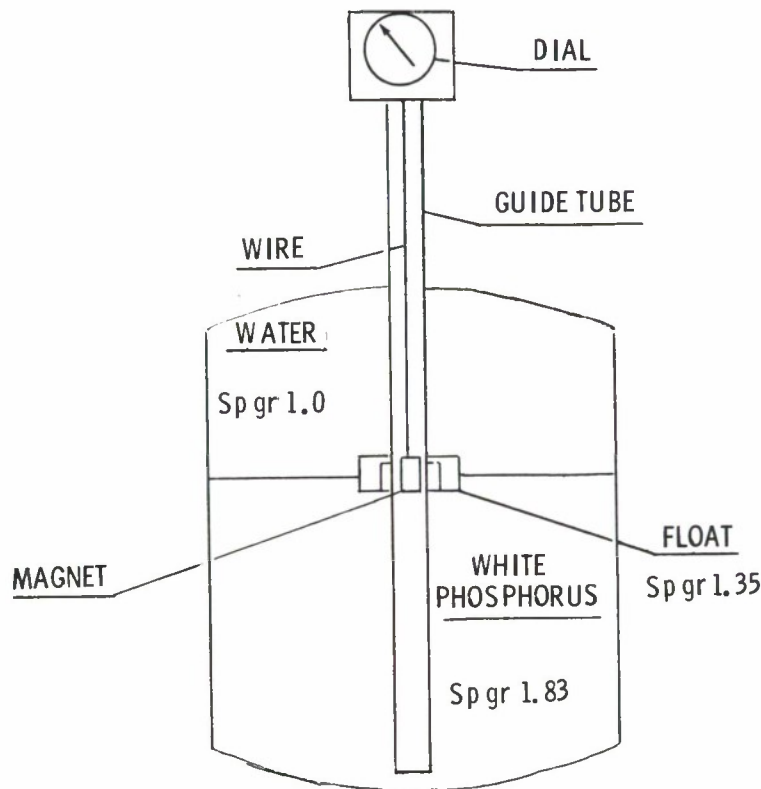
TITLE: PROVISION OF PROTOTYPE EQUIPMENT
FOR DETERMINATION OF LEVEL IN WHITE
PHOSPHORUS STORAGE TANKS.

COST: \$40,000

BENEFITS

- PROTOTYPE SYSTEMS WERE DEVELOPED TO PROVIDE THE CAPABILITY OF ACCURATELY MONITORING THE AMOUNT OF WHITE PHOSPHOROUS IN STORAGE TANKS.
- THE PROTOTYPE UNIT WAS INSTALLED AT PINE BLUFF ARSENAL AND HAS OPERATED FOR 3 YEARS WITHOUT MAINTENANCE. GAUGES WERE INSTALLED ON THE REMAINING TANKS AND THE 10 YEAR LABOR SAVINGS FROM EASIER MEASURING ARE ESTIMATED TO BE \$49,000.
- THE PRIMARY PURPOSE OF THIS PROJECT WAS TO ALLEVIATE A SAFETY/HEALTH PROBLEM.

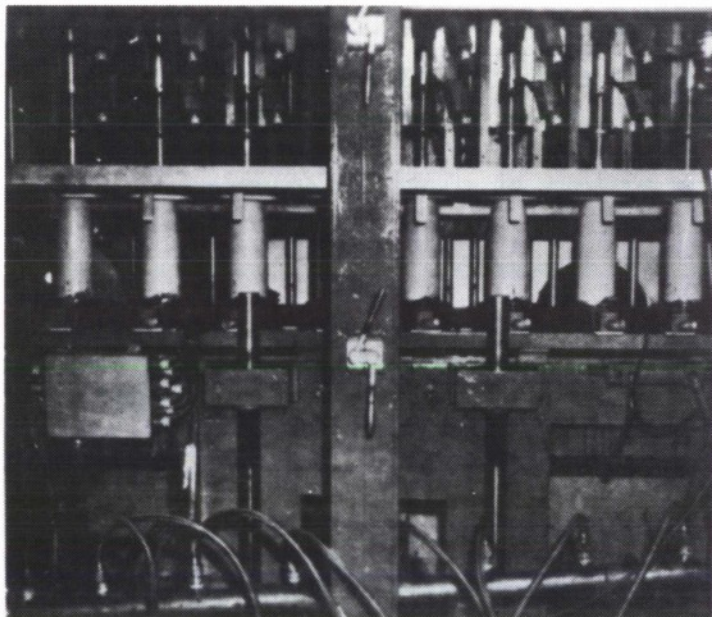
AUG 81



LEVEL GAUGING SYSTEM FOR
UNDERGROUND STORAGE TANKS

DARCOM MMT IMPLEMENTATION

WHITE PHOSPHORUS FILLING



WP DRY FILL STATION

EFFORT NO: 5 7X 1274

TITLE: WHITE PHOSPHORUS DRY FILL LINE

COST: \$1,796,000

BENEFITS

- **A PROTOTYPE PRODUCTION FACILITY WAS DESIGNED AND BUILT TO LOAD WP MUNITIONS UTILIZING A "DRY FILL" CONCEPT.**
- **THIS REPLACED THE WET PROCESS WHICH INVOLVED DIPPING THE ENTIRE MUNITION INTO THE WP.**
- **THIS WORK RESULTED IN REDUCTION OF 15 OPERATORS, A 10 YEAR COST SAVINGS OF \$5.2 MILLION, AND A 97% REDUCTION OF THE AIR/ WATER POLLUTION OVER THE OLD DIP FILL METHOD.**

AUG 81

DARCOM MMT IMPLEMENTATION

FLUIDIC CIRCUITS

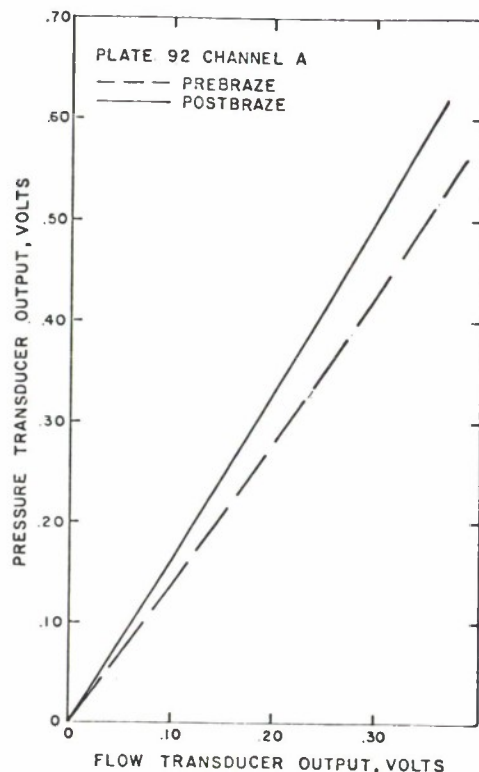
EFFORT NO: 5 7X 3139

TITLE: MANUFACTURE OF INTERCONNECTIONS
FOR FLUIDIC CIRCUITS

COST: \$145,000

BENEFITS

- FORM FLUXLESS BONDING PROCESSES WERE INVESTIGATED TO DEVELOP AN ALTERNATIVE TO STRAIGHT INTERATOMIC DIFFUSION BONDING IN THE ASSEMBLY OF ALUMINUM FLUIDIC DEVICES.
- THE MOST SUCCESSFUL WAS AN ALUMINUM SEMI-SOLID-STATE BONDING USING A BRAZE-CLAD SHEET SANDWICHED BETWEEN INTERCONNECTION PLATES.
- RESULTS WERE ADOPTED BY PRIVATE INDUSTRY IN THE PRODUCTION OF 3 STAGE GAIN BLOCKS FOR THE M60A1 GUN STABILIZATION. AN ESTIMATED \$100K SAVINGS RESULTED.



PLOT OF TRANSDUCER OUTPUTS SHOWING THE
EFFECTS OF BRAZING.

AUG 81

DARCOM MMT IMPLEMENTATION

CARTON DEPALLETIZATION & OPENING

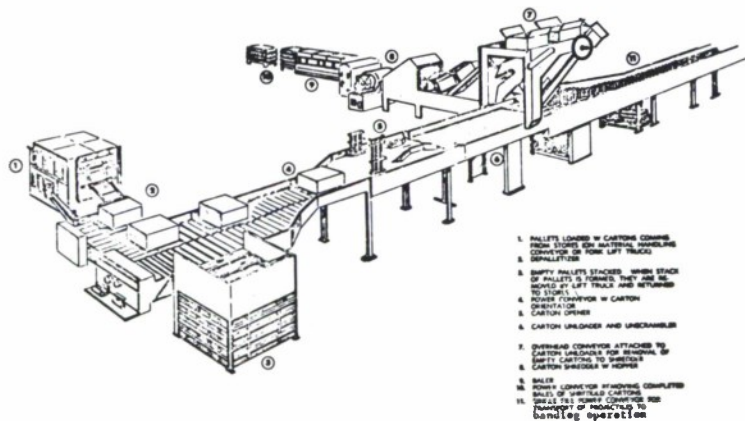
EFFORT NO: 5 7X 4069

TITLE: MODERNIZATION OF MORTAR BODY
DEPALLETIZATION AND CARTON OPENING

COST: \$454,000

BENEFITS

- A SYSTEM THAT ACCEPTS PALLETIZED 60MM & 81MM ROUNDS AND PLACES THEM ON THE MELT POUR CONVEYOR WAS DEVELOPED.
- OPERATIONS PERFORMED INCLUDE; DEPALLETIZING, CARTON SEPARATING AND UNSCRAMBLING, CARTON OPENING AND PLACING PROJECTILES ON THE CONVEYOR.
- THE PRIMARY PURPOSE OF THIS EFFORT WAS TO CONSERVE MANPOWER DURING MOBILIZATION. THEREFORE NO SAVINGS HAVE ACCRUED.



AUTOMATED DEPALLETER,
CARTON OPENER AND PROJECTILE UNLOADER

AUG 81

DARCOM MMT IMPLEMENTATION

8" PROJ. FORGING

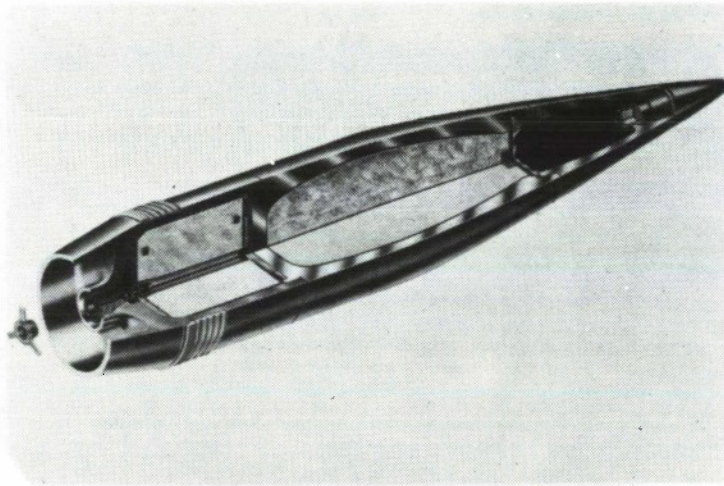
EFFORT NO: 5 7X 4148

TITLE: REDUCED WEIGHT FORGING FOR THE 8" MOTOR BODY.

COST: \$79,000

BENEFITS

- **A LIGHTWEIGHT FORGING WEIGHING APPROXIMATELY 20 LBS LESS THAN THE PREVIOUS FORGING WAS DEVELOPED FOR THE 8" M650 RAP ROUND.**
- **A 5 YEAR COST SAVING OF \$733,000 IS NOW BEING REALIZED. SAVINGS RESULT FROM REDUCTIONS IN 1) AMOUNT OF STEEL REQUIRED, 2) MACHINING TIME, AND 3) SHIPPING COSTS.**
- **THE PROCESS HAS BEEN IMPLEMENTED AND CONTRACTED WITH FERRULMATIC, INC.**



8 INCH RAP, M650

AUG 81

DARCOM MMT IMPLEMENTATION

DIE CASTING

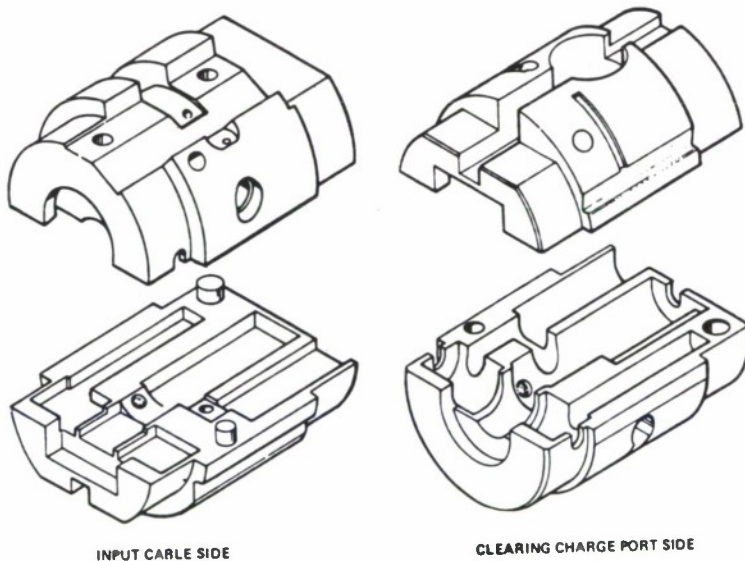
EFFORT NO: 5 7X 4416

TITLE: DEVELOP & PROVEOUT ALTERNATE MFG
PROCESSES FOR GEMSS SAFE AND
ARMING DEVICE

COST: \$120,000

BENEFITS

- A NEW DESIGN SPLIT ZINC DIE CAST HOUSING FOR THE GEMSS SAFE AND ARMING DEVICE WAS FABRICATED AND TESTED.
- THE DIE CAST PART IS LESS EXPENSIVE THAN THE BAR STOCK FABRICATED PART AND HAS BEEN INCLUDED IN THE XM74/75 TDP.
- A MANUFACTURING COST SAVING OF \$2.4 MILLION IS BEING REALIZED OVER 6 YEARS OF GEMSS PRODUCTION. THE GATOR AND MOPMS SYSTEMS ARE ADDITIONAL APPLICATIONS FOR THIS HOUSING.



TWO-PIECE GEMSS S&A DIE-CAST HOUSING

DARCOM MMT IMPLEMENTATION

IMPROVED INVESTMENT CASTING

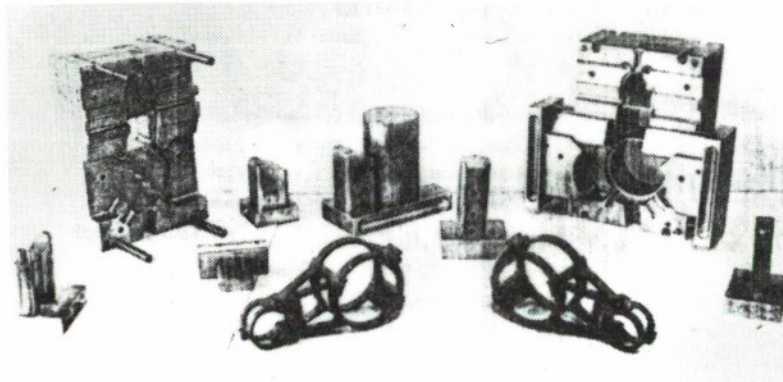
EFFORT NO: 6 7X 6769

TITLE: APPLICATION OF CERAMIC SHELL INVESTMENT CASTING PROCESS TO THE PRODUCTION OF CASTINGS.

COST: \$122,000

BENEFITS

- **AN IMPROVED CASTING PROCESS UTILIZING A CERAMIC SHELL MOLD IN PLACE OF THE SOLID MOLD WAS APPLIED TO SEVERAL COMPONENTS.**
- **ADVANTAGES INCLUDED: IMPROVED SURFACE FINISH AND DIMENSIONAL CONTROL FOR REDUCED MACHINING, REDUCED LEAD TIME AND LESS DEARB.**
- **APPLICATION OF THIS METHOD RESULTED IN TOTAL COST SAVINGS OF \$314,000 FOR 105MM-M68 AND 60MM-M225 COMPONENTS.**

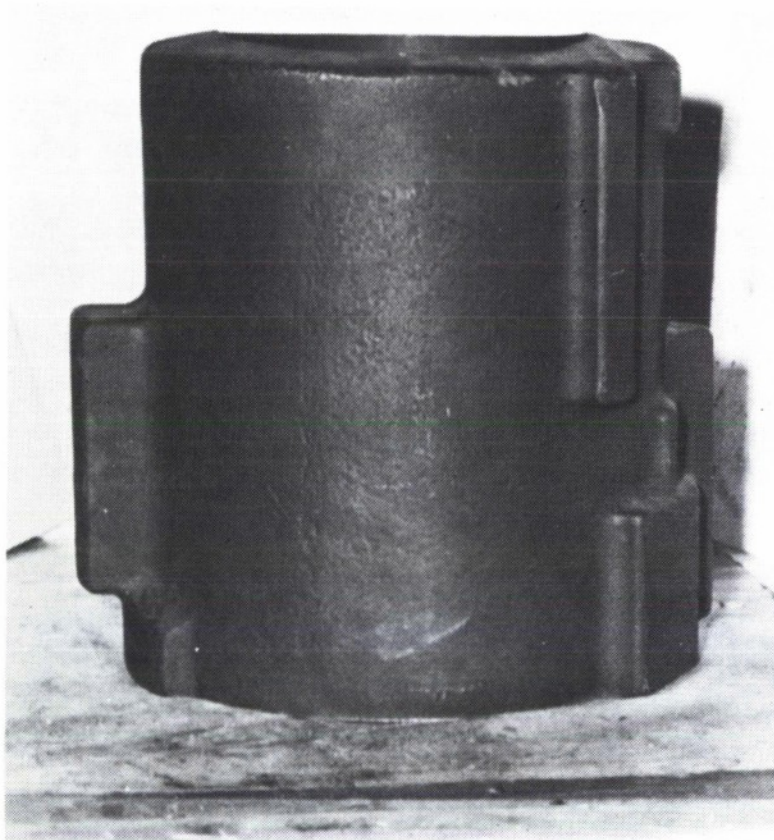


BRACKET & WAX MOLD

AUG 81

DARCOM MMT IMPLEMENTATION

PRECISION FORMING



155MM COUPLING

EFFORT NO: 6 70 7106

**TITLE: PRECISION FORMING THE EXTERNAL
CONFIGURATION OF THE 152MM M81E1
COUPLING**

COST: \$29,000

BENEFITS

- **THIS PROJECT CHANGED THE MANUFACTURING METHOD FOR THIS ITEM AND SIGNIFICANTLY REDUCED THE REQUIRED MACHINING TIME.**
- **THE PRIMARY CHANGE WAS FROM A STANDARD FORGING TO A PRECISION FORGING. WHILE THE PRECISION FORGING WAS SLIGHTLY MORE EXPENSIVE (5%), THE REDUCTION IN SUBSEQUENT MACHINING COST WAS 21%.**
- **TOTAL SAVINGS FOR THE THREE YEARS IN WHICH THESE ITEMS WERE PURCHASED WAS \$257,100.**

AUG 81

DARCOM MMT IMPLEMENTATION

OPTICAL COATINGS

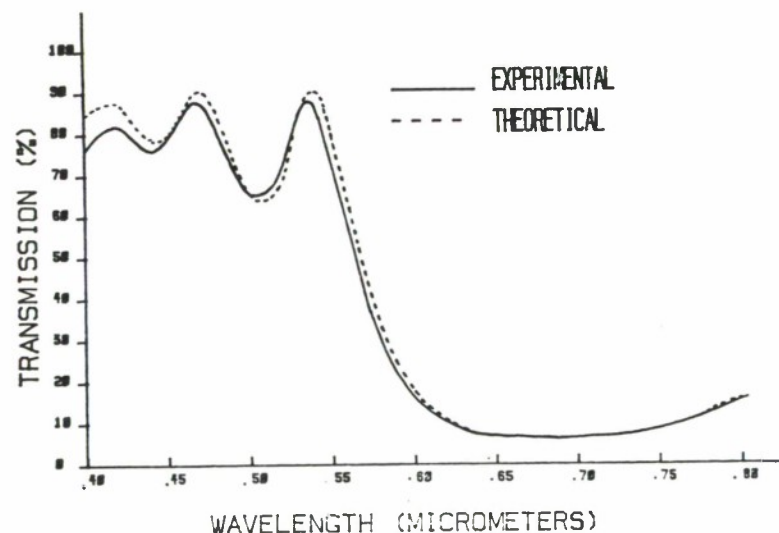
EFFORT NO: 6 7X 7180

TITLE: OPTICAL FILM ANALYSIS PROGRAM AND
COATING OF IR OPTICAL ELEMENTS.

COST: \$160,000

BENEFITS

- A COMPUTER PROGRAM WAS DEVELOPED TO PREDICT THE PERFORMANCE PARAMETERS OF FILM THICKNESS TOLERANCES.
- THE PROGRAM IS USED TO DETERMINE THE MOST COST EFFECTIVE TOLERANCES BASED ON A RANDOMLY PERTURBATED SIMULATION OF THE FILMS PHYSICAL CHARACTERISTICS.
- THE RESULTS OF THIS PROJECT WERE IMPLEMENTED BY 2 VENDORS (BENTON - CHERRY HILL, NJ AND OLCI - SANTA BARBARA, CA) AND AN ESTIMATE OF THE 10 YEAR SAVINGS IS \$1.65 MILLION.



EIGHT LAYER DICHROIC DESIGN

AUG 81

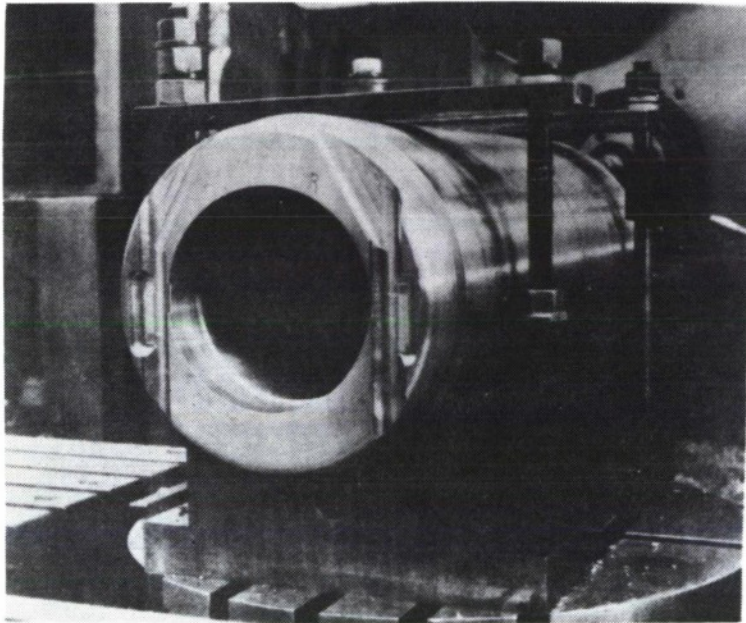
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FLOW-PROCESS ANALYSIS

EFFORT NO: 6 73 7242

**TITLE: GUN TUBE MANUFACTURE BY
AUTOMATION**

COST: \$195,000



**N/C MACHINING OF BREECH
FACE DETAIL**

BENEFITS

- **THIS STUDY RESULTED IN SEVERAL IMPROVEMENTS TO THE CANNON MANUFACTURING LINES.**
- **THE M68 & M198 PROCESSING WAS CONSOLIDATED UNDER ONE ROOF.**
- **A 3 AXIS N/C MACHINE WAS INCORPORATED FOR THE BREECH FACE EXTRACTOR DETAIL.**
- **A TUBE LOADING ASSEMBLY WAS DESIGNED TO FACILITATE THIS OPERATION.**
- **TEN YEAR SAVINGS OF \$981,300 ARE ESTIMATED AS A RESULT OF IMPLEMENTING THESE RECOMMENDATIONS.**

AUG 81

DARCOM MMT IMPLEMENTATION

IMPROVED RIFLING

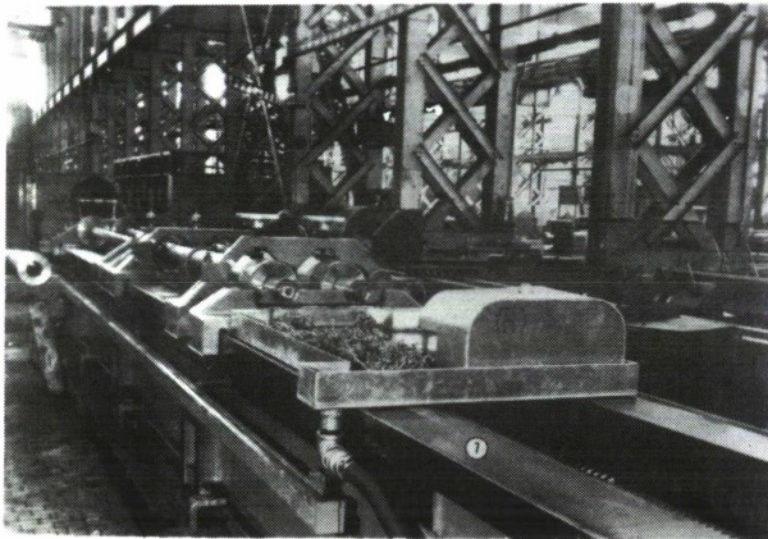
PROJECT NO: 6 74 7402 & 6 76 7402

**TITLE: DEVELOPMENT OF IMPROVED RIFLING
PROCEDURES AND EQUIPMENT**

COST: \$120,000 & \$46,000

BENEFITS

- **THIS PROJECT PROVIDED THE CAPABILITY OF RIFLING TWO CANNON TUBES AT ONE TIME FROM A SINGLE MACHINE.**
- **THE NILES RIFLER HAD SUFFICIENT POWER FOR THE DUAL OPERATION AND WAS MODIFIED WITH DUAL TOOLING.**
- **THIS EQUIPMENT IS CURRENTLY BEING USED TO RIFLE 105MM, M68 TUBES. ANNUAL SAVINGS ARE ESTIMATED TO BE \$65,000.**



DUPLEX RIFLING MACHINE

OCT 81

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PROOF TEST SIMULATIONS

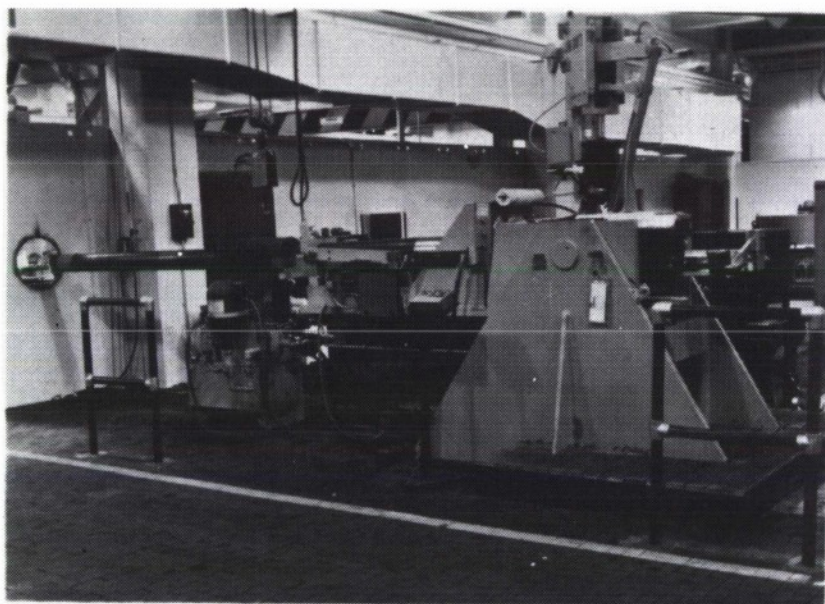
PROJECT NO: 6 75 7555

**TITLE: DYNAMIC PRESSURIZATION ACCEPTANCE
TESTING OF SLIDE BLOCK BREECH
MECHANISMS**

COST: \$98,000

BENEFITS

- **THE ARMY NOW HAS THE CAPABILITY TO SIMULATE THE SLIDE BLOCK BREECH MECHANISM PRODUCTION ACCEPTANCE TESTING.**
- **THIS SIMULATION REPLACES THE MUCH MORE COSTLY LIVE FIRING AND REDUCES THE TIME REQUIRED TO INVESTIGATE MALFUNCTIONS SINCE THE SIMULATIONS ARE PERFORMED ON-SITE.**
- **LIVE FIRING REQUIREMENTS HAVE BEEN REDUCED BY 75%**
- **AN ESTIMATED 10 YEAR SAVINGS OF \$565,000 WILL RESULT FROM THE IMPLEMENTATION OF THIS PROJECT.**



OCT 81

DARCOM MMT IMPLEMENTATION

ROTARY FORGING

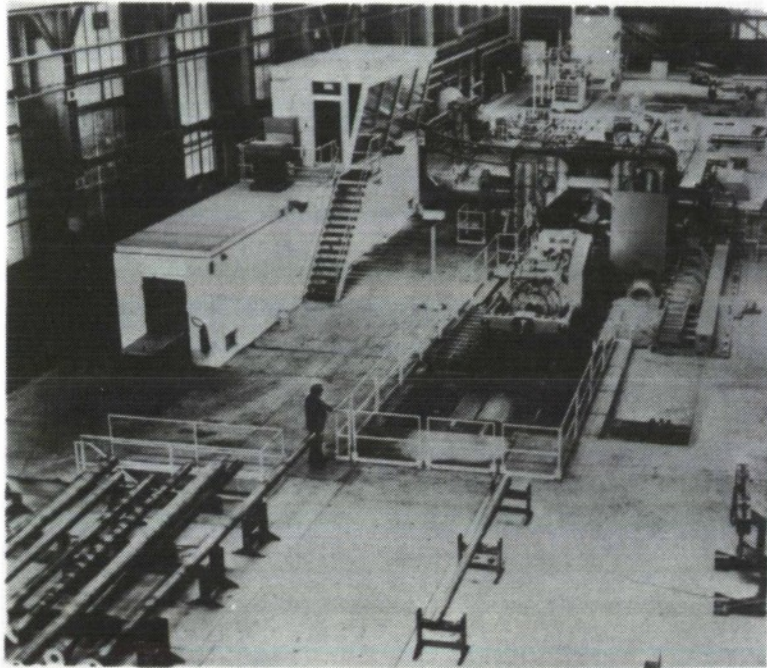
PROJECT NO: 6 77 7588

**TITLE: ROTATY FORGE INTEGRATED
PRODUCTION TECHNOLOGY**

COST: \$260,000

BENEFITS

- **AFTER INSTALLATION OF THE ROTARY FORGE CANNON LINE SEVERAL PROBLEMS WERE ENCOUNTERED. THIS PROJECT WAS INITIATED TO SOLVE THE QUENCH CRACKING, MELTING DURING INDUCTION HEATING AND MATERIAL PROBLEMS.**
- **AS RESULT OF THIS PROJECT THE EXPECTED SAVINGS OF \$600 PER M68 TUBE CAN BE ACHIEVED.**

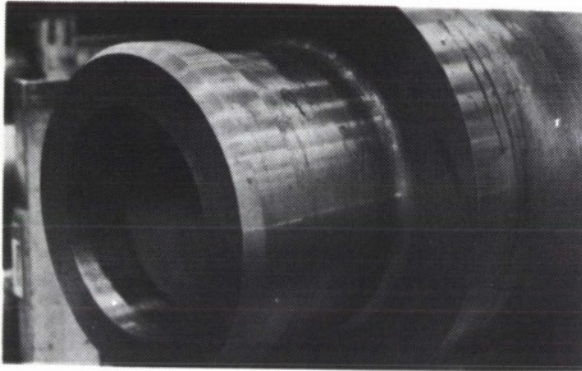


ROTARY FORGE

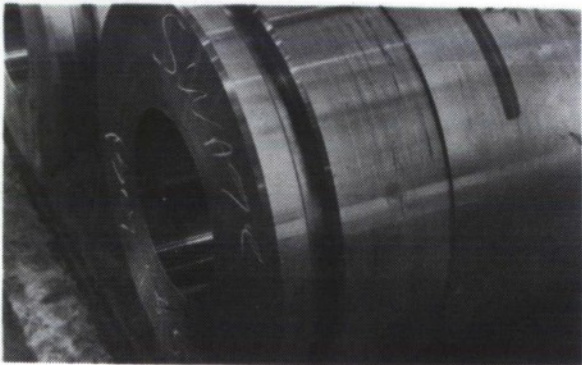
OCT 81

DARCOM MMT IMPLEMENTATION

8" M201 MACHINING



**PREVIOUS MACHINING 8" M201
(BEFORE MM&T)**



**MACHINING OF 8" M201
(AFTER IMPLEMENTATION)**

EFFORT NO: 6 7X 7733

**TITLE: ELIMINATION OF EXTERIOR TUBE MACHIN-
ING PRIOR TO SWAGE AUTOFRETTAGE.**

COST: \$47,000

BENEFITS

- **A MEANS OF REDUCING THE AMOUNT OF FACILITATING MACHINING ON THE 8 INCH M201 TUBE WAS DEVELOPED. THIS MACHINING IS ONLY PERFORMED TO HOLD THE TUBE DURING THE SWAGING OPERATION. IT PERFORMS NO USEFUL PURPOSE ON A FINISHED TUBE.**
- **THE PROCESS WAS SELF IMPLEMENTING ON THE 8 INCH GUN TUBE. AT A PRODUCTION RATE OF 600 BARRELS PER YEAR THIS PROCESS IS RESULTING IN A \$24,000 YEARLY SAVINGS.**

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